MIGUEL HERNANDEZ UNIVERSITY OF ELCHE

PhD Program in Sport and Health

Doctoral Thesis

An in-depth analysis of Dark Tetrad traits and a new approach to their assessment: indirect and objective measurement

A doctoral thesis presented by:

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This Doctoral Thesis is presented as a compendium of publications, in accordance with current regulations (Doctoral Studies Regulations Agreement of the Miguel Hernández University of Elche dated 29 May 2018, which regulates Royal Decree 99/2011). The scientific papers published and included in the body of this doctoral thesis are the following:

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D. José Antonio Piqueras Rodríguez, Catedrático de Universidad, y **D. David Pineda Sánchez**, Ayudante Doctor, ambos pertenecientes al Departamento de Psicología de la Salud de la Universidad Miguel Hernández, como director y codirector de la tesis.

AUTORIZAN

La presentación por compendio de publicaciones de la presente tesis doctoral titulada "An in-depth analysis of Dark Tetrad traits and a new approach to their assessment: indirect and objective measurement", realizada bajo nuestra dirección por Dña. Pilar Rico Bordera.

La tesis cumple los requisitos señalados por la normativa vigente y presenta un mínimo de un artículo correspondiente al primer cuartil (Q1) del Scimago Journal & Country Rank, por lo que reúne las condiciones para ser defendida ante el tribunal correspondiente para optar al grado de Doctor.

En Elche, septiembre de 2023

Fdo.: Dr. José Antonio Piqueras Rodríguez. Director.

Fdo.: Dr. David Pineda Sánchez. Codirector.

D. Francisco Javier Moreno Hernández, coordinador del Programa de Doctorado en Deporte y Salud.

AUTORIZA

El depósito y la defensa ante el tribunal correspondiente de la tesis doctoral "An in-depth analysis of Dark Tetrad traits and a new approach to their assessment: indirect and objective measurement" realizada por Dña. Pilar Rico Bordera, bajo la dirección del Dr. José Antonio Piqueras Rodríguez y la codirección del Dr. David Pineda Sánchez, para optar al grado de Doctor.
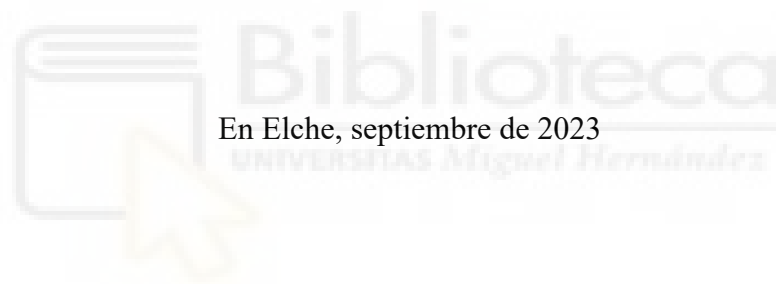
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A mi madre, a mi padre, a mis hermanas y a Javi.

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ABSTRACT

Abstract

The Dark Triad is a set of malevolent personality traits, composed of narcissism, Machiavellianism, and psychopathy. The Dark Tetrad adds sadism to this set of traits. These traits have received special attention due to their relation to a wide range of negative psychosocial outcomes, such as violent behaviour. In this doctoral thesis, two general objectives were formulated: **(1)** Broaden the understanding of dark traits (their relationship with other personality models and other variables of scientific interest). For this purpose, four studies were carried out with the following specific objectives and the following results. **Study 1**: Analyse the relationships between the Dark Triad model and the PEN model of general personality, including the relationship with the sincerity variable of this second model. Narcissism and Machiavellianism were positively related to neuroticism and extraversion, and psychopathy was negatively related to neuroticism and positively related to psychoticism. The three dark traits showed positive relationships with sincerity; **Study 2**: Analyse the relationship between civic engagement and personality (the Dark Triad and the Big Five traits). Narcissism and openness to experience were the factors most strongly associated with engagement. **Study 3**: Identify profiles based on the Dark Triad and Emotional Intelligence (EI). Three profiles were obtained: one with low scores on Dark Triad and EI; one with low scores on Machiavellianism and psychopathy, but medium-high scores on narcissism and high scores on EI; and one with high scores on Dark Triad and medium-low scores on EI. People in the second profile had higher self-esteem, psychological strengths, well-being, civic engagement, and lower personal distress and psychological difficulties. **Study 4**: Identify profiles based on Dark Tetrad and sociosexual orientation (unrestricted sex) and analyse the differences between them in terms of the different reasons for using Tinder. Three profiles were identified: one non-dark and non-sociosexual, one slightly narcissistic and sociosexual, and one very dark and slightly sociosexual. People in the first profile seem to use Tinder for the purpose of finding romantic partners, and those in the second for the purpose of having sexual encounters; **(2)** Improve the assessment of these dark traits by using instruments that complement self-report. To this end, three studies were carried out with the following specific objectives and the following results. **Study 5**: Validate a brief, valid and reliable measure to assess the Dark Tetrad, based on the combination of the Short Dark Triad and the Assessment of Sadistic Personality. Adequate internal consistency, criterion and construct validity values and good test-retest reliability indices were obtained for the new scale: the Dirty Twenty. **Study 6**: Synthesise the

instruments that have been used to assess the Dark Triad and Dark Tetrad traits objectively and indirectly through a systematic review. The use of more than 200 instruments was compiled. **Study 7**: Analyse the accuracy of observer-reports for assessing the Dark Triad and Dark Tetrad traits through a meta-analysis. Positive associations of medium magnitude were obtained between narcissism, Machiavellianism, and psychopathy assessed with self-reports and observer-reports. Narcissism and psychopathy were the most easily observable traits, and the more observers knew the persons to be observed, the greater the accuracy. The findings derived from this doctoral thesis allow two general conclusions to be drawn: (1) Unlike the other dark traits, narcissism maintains positive relationships with socially desirable variables. These people may display positive characteristics to achieve self-serving goals; (2) Self-report personality assessment has many advantages and the validated scales for measuring dark traits have adequate psychometric properties, such as the scale validated in this study. However, this assessment methodology also has some weaknesses, such as social desirability. In addition, people with high scores on dark traits may be sincere depending on the purpose of the assessment. This doctoral thesis has presented a synthesis of the objective tools used for the indirect assessment of the Dark Triad and Dark Tetrad traits, and statistical data on the accuracy of observer-reports have been presented. Using other tools that allow for more objective and indirect assessment may be the key to more complete and accurate assessments.

Key words: Dark Triad, Dark Tetrad, malevolent personality, self-report, objective measurement, indirect measurement.

Resumen

La Tríada Oscura es un conjunto de rasgos de personalidad malévolos, compuesto por el narcisismo, el Maquiavelismo y la psicopatía. La Tétrada Oscura añade a este conjunto de rasgos el sadismo. Estos rasgos han recibido especial atención debido a su relación con una gran variedad de resultados psicosociales negativos, como los comportamientos violentos. En esta tesis doctoral se formularon dos objetivos generales: **(1)** Ampliar la comprensión de los rasgos oscuros (su relación con otros modelos de personalidad y otras variables de interés científico). Para ello, se desarrollaron cuatro estudios con los siguientes objetivos específicos y los siguientes resultados. **Estudio 1**: Analizar las relaciones entre el modelo de la Tríada Oscura y el modelo PEN de personalidad general, incluida la relación con la variable sinceridad de este segundo modelo. El narcisismo y el maquiavelismo se relacionaron positivamente con el neuroticismo y la extraversión, y la psicopatía se relacionó negativamente con el neuroticismo y positivamente con el psicoticismo. Los tres rasgos oscuros mostraron relaciones positivas con la sinceridad; **Estudio 2**: Analizar la relación entre el compromiso cívico y la personalidad (la Tríada Oscura y los Cinco Grandes rasgos). El narcisismo y la apertura a la experiencia fueron los factores más fuertemente asociados con el compromiso. **Estudio 3**: Identificar perfiles basados en la Tríada Oscura y en la Inteligencia Emocional (IE). Se obtuvieron tres perfiles: uno con puntuaciones bajas en Tríada Oscura y en IE; uno con puntuaciones bajas en maquiavelismo y psicopatía, pero puntuaciones medias-altas en narcisismo y altas en IE; y uno con puntuaciones altas en Tríada Oscura y puntuaciones medias-bajas en IE. Las personas del segundo perfil presentaron mayor autoestima, fortalezas psicológicas, bienestar, compromiso cívico y menor angustia personal y dificultades psicológicas. **Estudio 4**: Identificar perfiles en base a la Tétrada Oscura y a la orientación sociosexual (sexo sin restricciones), y analizar las diferencias entre ellos en función de los diferentes motivos de uso de Tinder. Se identificaron tres perfiles: uno no oscuro y no sociosexual, uno ligeramente narcisista y sociosexual, y uno muy oscuro y ligeramente sociosexual. Las personas del primer perfil parecen usar Tínder con el fin de encontrar pareja romántica, y las del segundo con el fin de tener encuentros sexuales; **(2)** Mejorar la evaluación de estos rasgos oscuros utilizando instrumentos que complementen al autoinforme. Para ello, se desarrollaron tres estudios con los siguientes objetivos específicos y los siguientes resultados. **Estudio 5**: Validar una medida breve, válida y fiable para evaluar la Tétrada Oscura, basada en la combinación de la Short Dark Triad y del Assessment of Sadistic Personality. Se obtuvieron valores adecuados de

consistencia interna, de validez de criterio y de constructo, y buenos índices de fiabilidad test-retest para la nueva escala: la Dirty Twenty. **Estudio 6**: Sintetizar los instrumentos que se han utilizado para evaluar objetiva e indirectamente los rasgos de la Tríada y la Tétrada Oscura mediante una revisión sistemática. Se recopiló el uso de más de 200 instrumentos. **Estudio 7**: Analizar la precisión de los informes de los observadores para evaluar los rasgos de la Tríada y la Tétrada Oscura mediante un metaanálisis. Se obtuvieron asociaciones positivas de magnitud media entre el narcisismo, el maquiavelismo y la psicopatía evaluados con autoinformes y con informes de observadores. El narcisismo y la psicopatía fueron los rasgos más fácilmente observables, y cuanto más conocen los observadores a las personas a observar, mayor es la precisión. Los hallazgos derivados de esta tesis permiten extraer dos conclusiones generales: (1) A diferencia de los otros rasgos oscuros, el narcisismo mantiene relaciones positivas con variables socialmente deseables. Estas personas podrían mostrar características positivas con la finalidad de lograr objetivos en beneficio propio; (2) La evaluación de la personalidad mediante autoinforme presenta numerosas ventajas y las escalas validadas para medir los rasgos oscuros presentan adecuadas propiedades psicométricas, como la escala validada en este trabajo. No obstante, esta metodología de evaluación también presenta algunas debilidades, como la deseabilidad social. Además, puede que las personas con elevadas puntuaciones en los rasgos oscuros se muestren sinceras en función del objetivo de la evaluación. Esta tesis ha presentado una síntesis de las herramientas objetivas utilizadas para la evaluación indirecta de los rasgos de la Tríada y la Tétrada Oscura, y se han presentado datos estadísticos sobre la precisión de los informes de los observadores. Utilizar otras herramientas que permitan una evaluación más objetiva e indirecta puede ser la clave para lograr evaluaciones más completas y precisas.

Palabras clave: Tríada Oscura, Tétrada Oscura, personalidad malévola, autoinforme, medición objetiva, medición indirecta.

INTRODUCTION

1.   Personality in psychology

Historically, the term personality has been used to describe the individual differences between people and refers to an internal and relatively stable construct that tends to be consistent among different situations. This view of personality was put forward by different theoretical psychologists, such as Allport in 1937, and was later refined by other prominent theorists, such as Child, who in 1968 proposed defining personality as "more or less stable, internal factors that make one person's behaviour consistent from one time to another, and different from the behaviour other people would manifest in comparable situations" (p. 83). Based on this definition, stability, internal nature, consistency and difference or distinction have been established as basic assumptions of personality (Hampson, 2019).

This conceptualization of personality has served as a basis for further research, with numerous empirical studies examining the extent to which personality traits are stable over time and across different situations, due to their important role in predicting a wide range of life outcomes (Widiger et al., 2019). In this line, several meta-analyses and systematic reviews have studied its influence on, for example, general well-being, life satisfaction, positive affect, positive relationships, or personal growth. Also on the expression of mental disorders (such as depressive disorders, eating disorders or cognitive impairment) and on the development of antisocial or undesirable behaviours (such as physical, psychological, sexual, and online aggression) (Anglim et al., 2020; Bonfá-Araujo et al., 2022; Farstad et al., 2016; Fassino et al., 2013; Hakulinen et al., 2015; Huang et al., 2017; Luchetti et al., 2016; Moor & Anderson, 2019; Strickhouser et al., 2017; Thomas & Egan, 2022).

These empirical findings have led to the conclusion that the study of personality can help psychologist to have a better understanding of human behaviour, which in turn can improve the design of preventive measures, as well as the design of better treatments and interventions to improve people's well-being (e.g., Farstad et al., 2016; Fassino et al., 2013; Huang et al., 2017). For this reason, the inclusion of personality assessment in research has become of great relevance in psychology.

2.   Dark personality in psychology: The Dark Triad and Dark Tetrad

The Dark Triad (Paulhus & Williams, 2002) is a set of three personality traits that are conceptually distinct but empirically overlapping: narcissism, Machiavellianism, and psychopathy. These traits can display distinct associations, but they share an underlying

element of callous manipulation, so it is recommended to investigate all three variables simultaneously (Furnham et al., 2013; Paulhus, 2014; Paulhus et al., 2021; Paulhus & Williams, 2002).

Despite exhibiting both adaptive and maladaptive elements, each member of the Dark Triad shows a tendency towards offensive social behaviour, so, because of these characteristics, these traits have been described as "dark" (Furnham et al., 2013; Paulhus et al., 2021; Paulhus & Williams, 2002). However, although their descriptions may suggest that they are equivalent to clinical disorders, they are not, since the dark traits describe subtle forms of this disorders that are within the normal range of interpersonal functioning (Paulhus et al., 2021; Paulhus & Williams, 2002).

This set three personality traits was expanded to include the sadistic personality trait and to form the Dark Tetrad, according to a consensus reached by different authors (Buckels et al., 2013; Chabrol et al., 2009; Paulhus et al., 2021). This idea arose because of moderate correlations between the traits of the Dark Triad and sadism, which suggested that, while being distinct, these four traits share a common core (Chabrol et al., 2009). This last trait was, in a similar way, considered socially aversive at a subclinical level and therefore it was felt that it should be studied together with the other three due to their similarities (Paulhus, 2014; Paulhus et al., 2021). A recent meta-analysis reached the same conclusions (Bonfá-Araujo et al., 2022).

2.1. Narcissism

The narcissistic personality trait (as a "subclinical" or "normal" narcissism) was introduced by Raskin and Hall (1979; 1981) as a milder version of the personality disorder. This type of narcissism is characterized by behaviours and feelings of grandiosity, superiority, entitlement, and dominance (Paulhus & Williams, 2002; Raskin & Hall, 1979). Both Machiavellianism and psychopathy share similarities with narcissistic behaviour, such as manipulation and callousness. However, a defining feature of narcissism is the conflict between an exaggerated sense of self-importance and an underlying sense of insecurity (Jones & Paulhus, 2012, 2014).

The pursuit of ego reinforcement by people with this trait leads to self-destructive actions, fuelled by their grandiosity. They also tend to deceive themselves, believing their own exaggerations even when presented with evidence that contradicts them. Furthermore,

the grandiosity of narcissists can lead to feelings of entitlement and aggression when their self-importance is challenged (Jones & Paulhus, 2010; Paulhus & Williams, 2002; Vazire & Funder, 2006). Ultimately, the desire for ego reinforcement is what drives them to carry out their actions (Jones & Paulhus, 2014).

In addition, narcissism presents a tendency towards impulsivity to relate quickly to others generating favourable first impressions. However, their functional impulsivity benefits them in short-term social interactions, where prompt and eager responses are valued over accuracy, but as social interactions become more extended, their impulsivity can deteriorate these relationships (Jones & Paulhus, 2011; Vazire & Funder, 2006).

2.2. *Machiavellianism*

The personality trait of Machiavellianism refers primarily to a manipulative personality. It was firstly conceptualised by Richard Christie (Christie & Geis, 1970), who created a measure of normal personality by demonstrating that respondents who agreed with them were more likely to behave in a cold and manipulative way. People high in Machiavellian traits are grounded in reality to create their sense of self and do not exhibit self-enhancement (Christie & Geis, 1970; Paulhus & Williams, 2002).

Their tendency is to be cynical, lacking in principles and morality, and holding the belief that manipulating others is essential for achieving success in life; their actions are not characterized by impulsiveness, but rather by a strategic orientation (Jones & Paulhus, 2009, 2011, 2014). These people engage in advance planning, establish alliances, and take steps to uphold a favourable image and reputation. In sum, the Machiavellianism personality trait is characterized by callous affect, manipulativeness, and a strategic-calculating orientation (Jones & Paulhus, 2014).

2.3. *Psychopathy*

The introduction of the psychopathy personality trait (again, as "subclinical", like narcissism) began with the work of Hare (1985) and Lilienfeld and Andrews (1996). This type of psychopathy is characterized by high levels of impulsivity and thrill-seeking, paired with low levels of empathy and anxiety (Paulhus & Williams, 2002). In this way, two primary components are identified: callousness or a lack of affect, and impulsivity or a deficit in self-control. Notably, the latter characteristic is a core component that remains a defining feature of psychopathy (Hare, 1995; Hare & Neumann, 2008).

In contrast to narcissism, the impulsivity of people with psychopathic traits is characterized as dysfunctional because they lack the ability to inhibit antisocial impulses, which can lead to antisocial and self-destructive behaviours, even at subclinical levels (Jones & Paulhus, 2011). Associated with this impulsivity, they may disregard the feelings of others without caring about their own reputation (Hare & Neumann, 2008). They demonstrate callousness, which, when combined with recklessness and thrill-seeking, can lead to criminal behaviour. Additionally, their low levels of anxiety, in combination with disagreeable tendencies, can render them particularly duplicitous (Jones & Paulhus, 2014; Paulhus & Williams, 2002).

2.4. *Sadism*

Finally, the sadistic personality trait (known as "everyday sadism"), as mentioned before, was introduced to the set of dark traits as proposed by several authors (e.g., Buckels et al., 2013; Chabrol et al., 2009). People high in this trait may tend to engage a cruel and demeaning behaviour towards others, seeking to observe or inflict physical, psychological, or sexual pain on others to assert dominance, or for their own enjoyment. These intrinsic motivations mean that the sadistic trait may be more immoral than other forms of antisocial behaviour driven by external factors (Buckels et al., 2013; Chabrol et al., 2009; O'Meara et al., 2011; Paulhus, 2014). This idea assumes that anyone (i.e., not necessarily the clinical or forensic population) can enjoy or obtain a certain feeling of pleasure from cruel behaviours (e.g., violent films or military incidents), being this type of cruelty enjoyment considered the main characteristic of the sadistic personality trait (Baumeister & Campbell, 1999).

Another characteristic that tends to be associated with a sadistic personality is a lack of empathy. Nonetheless, genuine sadism entails exploiting an individual's particular shortcomings and susceptibilities to inflict suffering. This suggests that people with sadistic tendencies may possess some level of empathy, at least at a cognitive level (Baumeister & Campbell, 1999; O'Meara et al., 2011). Furthermore, for all these characteristics, the sadistic personality trait has been associated with delinquent behaviour (Chabrol et al., 2009).

3. Dark personality model and general personality models: relationships between traits

As discussed at the beginning of this doctoral thesis, the study of personality can lead to a better understanding of human behaviour, which in turn can improve the design of preventive measures, as well as the design of better treatments and interventions to improve people's well-being (e.g., Farstad et al., 2016; Fassino et al., 2013; Huang et al., 2017). On this basis, the study of personality has been a central focus within the field of psychology, and over time, several models or taxonomies have emerged to capture its complexity. Among the most prominent are three well-known models: the PEN model (Eysenck & Eysenck, 1975), the Big Five model (Goldberg, 1990), and the HEXACO model (Ashton & Lee, 2001, 2007). These set of traits have played significant roles in shaping our understanding of personality traits and their impact on various aspects of human behaviour.

The PEN model, proposed by Eysenck and Eysenck (1975), was one of the pioneering models in personality psychology. It emphasized three fundamental dimensions of personality: psychoticism, extraversion, and neuroticism. Psychoticism measured traits related to aggression, impulsivity, and tough-mindedness, while extraversion encompassed sociability, assertiveness, and enthusiasm. Neuroticism, on the other hand, reflected emotional instability, anxiety, and vulnerability to stress (Eysenck, 1990; Eysenck & Eysenck, 1975, 1985).

Following the PEN model, but using a different approach to establish the "most important traits" in the personality taxonomy, the Big Five model gained prominence as a comprehensive framework for personality assessment (Goldberg, 1990). This set of traits, also known as the Five-Factor Model (FFM), identifies five broad dimensions of personality that capture a wide range of individual differences. These dimensions are openness to experience, conscientiousness, extraversion, agreeableness, and neuroticism: Openness to experience refers to curiosity, imagination, and willingness to embrace new ideas; conscientiousness involves traits like organization, responsibility, and self-discipline; extraversion pertains to sociability, assertiveness, and positive affect; agreeableness relates to compassion, cooperativeness, and altruism; and neuroticism continues to represent emotional instability, anxiety, and vulnerability to stress, similar to the PEN model (Goldberg, 1990, 1992; McCrae & Costa, 1987).

Finally, in more recent years, the HEXACO model has gained attention as an extension of the Big Five model (Ashton & Lee, 2001, 2007). This model incorporates an additional dimension known as honesty-humility alongside the Big Five factors. Therefore,

the six dimensions of the HEXACO model are honesty-humility, openness to experience, conscientiousness, extraversion, agreeableness, and neuroticism. Honesty-Humility captures traits related to sincerity, fairness, and greed-avoidance, expanding the scope of personality assessment beyond the Big Five model (Ashton & Lee, 2001, 2007, 2008).

A considerable amount of empirical research has explored the associations between the Dark Triad or Dark Tetrad personality traits and the two later models of personality, i.e., the FFM and the HEXACO model (e.g., Book et al., 2016; Cheung & Egan, 2021; Fernández-del-Río et al., 2020; Koehn et al., 2019; Lee, 2019; Muris et al., 2022; Nai & Toros, 2020; Oda & Matsumoto-Oda, 2022; Schreyer et al., 2023). Many of these papers have included both one of these two general personality models and the dark model to analyse any other variable of interest. Although the same significant relationships have not been obtained in all studies, generally Machiavellianism, psychopathy and sadism are positively related to neuroticism and negatively related to the other five factors. In contrast, narcissism seems to be positively related to extraversion, openness to experience, and conscientiousness; and negatively related to agreeableness, neuroticism, and honesty-humility. Especially, narcissism seems to present more inconsistent correlational results with these other traits, since in some cases the relationship with openness to experience and conscientiousness has also been negative, and with neuroticism it has been positive.

However, limited empirical investigation has been conducted to directly examine the relationship between these dark traits and the PEN model (Mohammadzadeh & Ashouri, 2018; Pineda et al., 2020). Moreover, the existing research that does examine this association has yielded inconsistent findings because in one case Machiavellianism correlates positively with all three factors, narcissism with psychoticism and extraversion, and psychopathy with neuroticism and psychoticism (Mohammadzadeh & Ashouri, 2018); while in the other case Machiavellianism correlates positively with neuroticism and psychoticism, narcissism only with extraversion, and psychopathy only with psychoticism (Pineda et al., 2020).

In short, given that personality can lead to a greater understanding of how people behave, many of the studies cited in this section have included both general personality and dark personality in their studies when they wanted to deepen the understanding of a behavioural variable. In this sense, the FFM and the HEXACO model seem to have received more attention, while the PEN model has rarely been analysed together with the dark personality model. In addition, the best-known scale for measuring the three factors of the

PEN model, i.e., the Eysenck Personality Questionnaire Revised-Abbreviated (EPQR-A; Francis et al., 1992), includes the measurement of a variable of great relevance when analysing undesirable traits (such as dark personality traits) as will be seen in the following sections of this paper: sincerity.

4. The study of Dark Triad and Dark Tetrad and its relation to other positive and negative outcomes. Its influence on a wide variety of characteristics and behaviours

The study of the Dark Triad and Dark Tetrad traits has garnered significant attention in recent years due to their potential implications for understanding the development of antisocial behaviour, given their relationships with a wide range of negative psychosocial outcomes, as evidenced in several meta-analyses (Bonfá-Araujo et al., 2022; Muris et al., 2017). Consequently, researchers have undertaken extensive investigations into the relationship between these malevolent traits and various forms of antisocial or undesirable behaviour, such as intimate partner violence, bullying and cyberbullying, sextortion, different types of aggression (physical, verbal, and sexual), unmoral beliefs, attraction to violent and aggressive games, and difficulties in emotional regulation, among others (e.g., Alsheikh Ali, 2020; Bonfá-Araujo et al., 2022; Chabrol et al., 2017; Hayes et al., 2021; Moor & Anderson, 2019; Pineda et al., 2021; Pineda, Galán, et al., 2022; Pineda, Rico-Bordera, et al., 2022; Spaans et al., 2017; Thomas & Egan, 2022). These studies have sought to elucidate the ways in which these traits are manifested in different contexts, and to identify potential moderators and mediators of their relationship with antisocial behaviour. Collectively, these findings highlight the importance of understanding the role of these traits in the development of antisocial behaviour.

Similarly, researchers have also explored the relationship between the Dark Triad and Dark Tetrad traits and other positive or socially accepted variables, including empathy, emotional intelligence (EI), civic engagement, and well-being, for example (Bonfá-Araujo et al., 2022; Kircaburun et al., 2019; Pajevic et al., 2018; Pruysers et al., 2019; Schreyer et al., 2023; Szabó & Bereczkei, 2017; Van Groningen et al., 2021; Veselka et al., 2012). The goal of these investigations is, again, to better understand the mechanisms underlying these malevolent traits. Thus, these recent works have yielded significant insights into the relationships between these traits and these positive variables finding, in general, differences between narcissism and the other three traits of the Dark Tetrad. Specifically, the

relationships found between the narcissistic trait and socially accepted variables have sometimes been positive, whereas with the other three traits the relationships are negative (Bonfá-Araujo et al., 2022; Kircaburun et al., 2019; Pajevic et al., 2018; Pruysers et al., 2019; Schreyer et al., 2023; Szabó & Bereczkei, 2017; Van Groningen et al., 2021; Veselka et al., 2012).

Because of these different relationships between the dark traits, several studies have endeavoured to explain the positive correlation between narcissism and socially acceptable variables, such as empathy, EI, civic engagement, or well-being. Van Groning et al. (2021), for example, contend that the presence of other socially desirable traits or skills may endow narcissism with a protective quality, relative to the remaining traits of the Dark Triad. Narcissism has come to be seen as the 'shining member' of this set of dark traits and may be a protective factor in relation to the other traits (Nagler et al., 2014; Van Groningen et al., 2021).

 In turn, Pruysers et al. (2019) suggest that individuals with narcissistic traits may actively seek praise and admiration, thereby engaging in prosocial behaviours and exhibiting other desirable attributes. Furthermore, it is widely recognized that people with narcissistic traits incessantly strive to enhance their self-esteem and ego so they may use people as a means to reinforce their self-esteem and achieve their goals (they may, for example, decide to perform acts of benevolence for such purposes) (Alexander et al., 2010; Back, 2018; De Holanda Coelho et al., 2021).

However, a recent meta-analysis concluded that one should not make the mistake of believing that narcissism leads to psychological adjustment despite its associations with some desirable outcomes such as those discussed above (Blasco-Belled et al., 2023). They argued that, based on previous literature, improvements in well-being do predict greater narcissism, but that increases in narcissism do not predict improvements in well-being (e.g., Zuckerman & O'Loughlin, 2009). Furthermore, this meta-analysis concluded the existence of a positive relationship with well-being, but only with one facet of narcissism, namely grandiose narcissism (which corresponds to Dark Triad narcissism; Jones & Paulhus, 2014); as well as with the boldness/dominance facets of psychopathy (Blasco-Belled et al., 2023).

Even so, it has been argued that in some contexts, such as the workplace, the presence of these traits in people may be somewhat adaptive, for example, when it comes to acquiring

leadership positions or senior positions. Thus, what has been argued is that each of these dark traits may not only be maladaptive, but also adaptive for individuals to some extent (Furnham, 2010; Furnham et al., 2013; Hogan, 2007; Hogan & Hogan, 2001; Paulhus, 2014; Paulhus et al., 2013).

Collectively, these findings highlight the importance of understanding the complex relationships between the Dark Triad and Dark Tetrad traits and other personality variables and suggest potential areas for future research. In particular, the importance of further exploration of these relationships is emphasized given the positive relationships that have been found in some cases between narcissism and these positive variables. In sum, some of the previous studies have concluded that people with narcissistic traits may behave positively for their own benefit or to reinforce their own self-esteem, and may even be a more adaptive trait compared to the rest of the dark traits (Alexander et al., 2010; De Holanda Coelho et al., 2021; Paulhus & Williams, 2002; Van Groningen et al., 2021).

In any case, in the first section of this doctoral thesis it was argued that the study of personality can lead to a better understanding of human behaviour because of the close relations and influences they maintain (Farstad et al., 2016; Fassino et al., 2013; Huang et al., 2017). Therefore, it is relevant to appreciate that, like general personality, Dark Tetrad traits are also related to specific behaviours and motivations in contexts of social interactions and personal relationships, as we have seen in this section (their relationship with the variables discussed above).

In this sense, as discussed above, and given the relationships of these traits with a variety of antisocial behaviours (see above), it is interesting to know how they can influence social behaviours and interaction choices. Today, the Internet and social networks have changed the way people interact with each other and many people are beginning to prefer them over face-to-face interactions because of their advantages (such as its ease of use and accessibility) (Anzani et al., 2018; David & Cambre, 2016; Duguay, 2017; Smith, 2016; Sumter et al., 2017). Therefore, when studying how people behave and interact, it seems relevant to look at how they do so via the Internet. Thus, a topic of current interest is to analyse how these dark traits may influence the execution of social behaviours through applications that allow people to meet new people (Freyth & Batinic, 2021; Lyons et al., 2022; Timmermans et al., 2018).

Recent studies have shown that personality is a determining variable in, for example, the motives for using social networks and apps. Thus, for example, the relationship between Dark Tetrad traits and the motives for using dating apps has been analysed and the results have indicated that people with these traits might use dating apps for different utilitarian motives, such as the pursuit of sex or social approval (Freyth & Batinic, 2021; Lyons et al., 2022; Timmermans et al., 2018).

5. Self-reports in the assessment of Dark Triad and Dark Tetrad: from the oldest to the most recent instruments

Researchers have developed several scales that aim to assess the Dark Triad and the Dark Tetrad traits and provide insight into an individual's personality. In this regard, the first self-reports that were validated focused specifically on measuring these traits individually, as they were published before the formation of the dark trait set, i.e., before the publication of the Dark Triad or the Dark Tetrad (although some of them were designed after its creation, as will be seen below) (Back et al., 2013; Christie & Geis, 1970; Collison et al., 2018; Dahling et al., 2009; Glover et al., 2012; Hare, 1985; Levenson et al., 1995; Lilienfeld & Andrews, 1996; O'Meara et al., 2011; Paulhus & Jones, 2015; Plouffe et al., 2017; Raskin & Hall, 1979). Subsequently, after their publication, self-reports measuring the set of traits were designed and validated (Jonason & Webster, 2010; Jones & Paulhus, 2014; Paulhus et al., 2021; Plouffe et al., 2017; Webster & Wongsomboon, 2020). The most common and popular ones are presented below (e.g., Furnham et al., 2013).

5.1. Narcissism

The most popular scale used to measure trait narcissism is the Narcissistic Personality Inventory (NPI-40; Raskin & Hall, 1979). It is a widely used self-report questionnaire designed to measure grandiose narcissism, understood as a trait characterized by an inflated sense of self-importance, a preoccupation with fantasies of power, success, and attractiveness, and a lack of empathy towards others. The NPI-40 consists of 40 pairs of items (i.e., one narcissistic and one non-narcissistic statement), and the respondent must mark the statement that best describes him or her. The items are designed to assess the following seven components of narcissism: authority, exhibitionism, superiority, entitlement, exploitativeness, self-sufficiency, and vanity. Its original version showed

adequate psychometric properties, with an (Cronbach's Alpha – α) for the total scale = .80 (Raskin & Hall, 1979).

There are additional measuring self-reports created to assess narcissism such as the Narcissistic Admiration and Rivalry Questionnaire (NARQ; Back et al., 2013), made up of 18 items and two factors of grandiose narcissism (agentic/admiration and antagonistic/rivalry), and the Five-Factor Narcissism Inventory (FFNI; Glover et al., 2012), of 148 items and 15 traits related to vulnerable and grandiose narcissism.

5.2. *Machiavellianism*

The most commonly used scale to assess Machiavellianism has been the MACH-IV (Christie & Geis, 1970). This questionnaire was designed to assess levels of Machiavellianism characterized by manipulativeness, cynicism, and a focus on personal gain. It consists of 20 items, each of which is a statement to which respondents indicate their level of agreement on a five-point Likert scale ranging from *strongly disagree* to *strongly agree*. The statements cover a range of behaviours and attitudes that are associated with Machiavellianism, specifically, three core components of Machiavellianism: tactics, Machiavellian views, and abstract morality. The average level of internal consistency (α) in 19 studies that were published from 1984 to 2012 was .70 (Monaghan, 2019).

Other common scales used in the measurement of Machiavellianism are the Machiavellianism Personality Scale (MPS; Dahling et al., 2009) with 16 items and four factors (distrust of others, desire for status, desire for control, and amorality), and the Five Factor Machiavellianism Inventory (FFMI; Collison et al., 2018), composed of 52 items and three factors (antagonism, agency, planfulness).

5.3. *Psychopathy*

The best-known scale for measuring the trait of psychopathy has been the Self-Report Psychopathy Scale (SRP; Hare, 1985) and, more specifically, the SRP-III (Paulhus et al., in press), based on the conceptualization of psychopathy as a constellation of interpersonal, affective, and behavioural features. It consists of 64 items, each of which is a statement to which respondents indicate their level of agreement on a five-point Likert scale ranging from *strongly disagree* to *strongly agree*, that measures different dimensions of psychopathy: interpersonal manipulation, callous affect, erratic lifestyle, and criminal tendencies. The total score on the SRP-III is calculated by summing the responses to all 64 items. Higher scores

indicate a greater level of psychopathic traits. Its original version showed adequate psychometric properties, with an α for the total scale of .93, and between .78 and .86 for the subscales (Paulhus et al., in press).

Other known scales designed to measure psychopathy include the Levenson Self-Report Psychopathy Scale (LSRP; Levenson et al., 1995), with 26 items and two factors (affective/interpersonal and impulsive/irresponsible behavioural), and the Psychopathic Personality Inventory (PPI; Lilienfeld & Andrews, 1996), composed of 187 items and two factors as well (fearless dominance and impulsive antisociality).

5.4. *Sadism*

Finally, the most used scale to assess sadism has been the Short Sadistic Impulse Scale (SSIS; O'Meara et al., 2011), a 10-item self-report measure that assesses an individual's tendency to experience sadistic impulses or fantasies. The items on the SSIS form a screening for sadistic impulse and cover a range of sadistic behaviours, including enjoying hurting people, taking pleasure in seeing others suffer, and feeling the urge to humiliate others. Participants are asked to rate each item on a 5-point scale, ranging from *strongly disagree* to *strongly agree*, and higher scores indicating a greater tendency toward sadistic impulses or fantasies. The original measure reported a reliability value of α = .86 (O'Meara et al., 2011).

Other scales developed to measure sadism include the Assessment of Sadistic Personality (ASP; Plouffe et al., 2017) which consists of 9 items to assess everyday sadism, and the Varieties of Sadistic Tendencies (VAST; Paulhus & Jones, 2015) of 16 items to assess direct and vicarious sadism.

5.5. *Dark Triad*

The first scale that was developed to assess the Dark Triad, that is, the three dark traits together (narcissism, Machiavellianism, and psychopathy) with the same self-report structure, was the Dark Triad Dirty Dozen (DTDD; Jonason & Webster, 2010). It consists of a set of 12 (four per trait), and participants rate their level of agreement or disagreement with each statement on a seven-point scale, with 1 indicating *strongly disagree* and 7 indicating *strongly agree*. The total score is calculated by summing the responses across all 12 questions, with higher scores indicating a greater likelihood of having dark triad traits. In

its original version, good reliability indices were obtained, with an α = .78 for narcissism, α = .70 for Machiavellianism, and α = .69 or psychopathy.

Subsequently, the Short Dark Triad (SD3; Jones & Paulhus, 2014) was developed, a very popular scale used to measure, like the DTDD, the three dark traits in the same self-report. This scale consists of three sets of nine items per trait, comprising a total of 27 items that respondents must rate on a five-point scale ranging from *strongly disagree* to *strongly agree*, with higher scores indicating greater levels of each trait. Its original version also obtained good internal consistency indices, with an α = .78 for narcissism, α = .76 for Machiavellianism, and α = .73 or psychopathy.

5.6. *Dark Tetrad*

After including everyday sadism as the fourth trait to the Dark Triad and, consequently, creating the Dark Tetrad, Plouffe et al. (2017) were the first to propose the combination of the SD3 (Jones & Paulhus, 2014) and the ASP (Plouffe et al., 2017) to obtain a measure that would jointly measure the traits of the Dark Tetrad, i.e., narcissism, Machiavellianism, psychopathy, and sadism. In total, this combination would form a scale with a total of 36 items, with nine items per trait, which would be answered on a 5-point Likert-type scale that ranges from 0 (*strongly disagree*) to 4 (*strongly agree*), as would the separate versions of the two scales.

Subsequently, Paulhus et al. (2021) published the Short Dark Tetrad (SD4), the first scale specifically designed to measure the four traits of the Dark Tetrad. The wording of some of its items was very similar to those included in the combination proposed by Plouffe et al. (2017), but in this case the scale comprised a total of 28 items. Later, a shorter version of the SD4, the Hateful Eight (H8), was designed, which included only 16 items (Webster & Wongsomboon, 2020).

The scales mentioned in this section, that is, both those designed to evaluate the dark traits individually and those designed to evaluate them together with the same self-report, have a validated version with a Spanish sample (e.g., MACH-IV, Corral & Calvete, 2000; NPI-40, Cortés-Sotres & García-Garduño, 1998; NARQ, Doroszuk et al., 2020; SRP-III, Gómez-Leal et al., 2021; DD and SD3, SSIS and ASP, Pineda et al., 2020, 2021; SD4, Ortet-Walker et al., 2021, 2022).

6. Self-report: the "gold standard" technique in psychology assessment. Advantages and disadvantages

For many years, self-reports have been the most widely used method for assessing an individual's personality (Abernethy, 2015; Fernández-Ballesteros & Botella-Ausina, 2008; Paulhus & Vazire, 2007; Romero et al., 2020). This method involves individuals reporting their own perceptions and observations of their behavioural tendencies in a questionnaire, providing an indirect assessment of their personality traits. This approach assumes that individuals have insight into their own behaviour, making their self-perceptions a reliable source of information (Kyllonen & Kell, 2018; McDonald, 2008; Ortner & Proyer, 2015; Paulhus & Vazire, 2007).

However, self-report assessments are not perfect, and the results obtained from them can be influenced by several factors, although they are considered the "gold standard" for personality assessment (Durmaz et al., 2020; Kyllonen & Kell, 2018; Proyer & Häusler, 2007; Santacreu et al., 2006). In fact, some studies have shown that the correlation between self-reports of personality traits and observers' reports of personality traits is not very high, ranging from $r = .29$ to $r = .41$. This indicates that self-reports only capture a portion of an individual's actual behaviour and may not provide an accurate representation of their personality traits (Connelly & Ones, 2010; Kyllonen & Kell, 2018, p. 8).

Self-report, and specifically its use in psychological assessment, offers a range of advantages summarized in the work of McDonald (2008). These advantages include (1) practicality and efficiency, (2) ease and convenience of administration, (3) cost-effectiveness, (4) direct access to unique personal information, (5) individual motivation to respond, (6) the ability to control most response biases, (7) the availability of numerous psychometrically tested inventories, (8) and its status as the most widely used method. However, the disadvantages of this method of evaluation include (1) potential issues with the credibility of responses due to response biases such as socially desirable responding, acquiescent responding, and extreme responding; (2) and errors in memory due to the inability to reconstruct a memory and which may result in the creation of erroneous information. (3) Additionally, this method assumes that respondents are self-aware and knowledgeable, and that they do not have distorted self-perceptions; (4) and there may also be issues with non-context-specific language use in the questions, as well as cultural limitations (Abernethy, 2015; McDonald, 2008).

Self-report assessments are significantly influenced by social desirability bias, a phenomenon in which participants tend to respond in a manner they perceive as socially desirable (a manner that they believe will be viewed favourably by others), even if those responses are not entirely truthful or accurate (Durmaz et al., 2020; Ganster et al., 1983). As a consequence, data collected through these self-report methods may not accurately reflect the true behaviour of the sample and may underestimate the prevalence of socially undesirable behaviours, so it is important to take this into account in assessments (Abernethy, 2015; Althubaiti, 2016; Durmaz et al., 2020; Podsakoff et al., 2003).

This tendency is especially prevalent and becomes more important to consider when addressing sensitive or undesirable behaviour and personality, such as drug use, unethical behaviour, or psychopathic trait (Althubaiti, 2016; Rogers et al., 2002; Tourangeau & Smith, 1996; Vigil-Colet et al., 2012). Thus, for example, studies have found that individuals tend to underreport their levels of aggression or their levels of psychopathy on self-report assessments due to social desirability concerns (e.g., Rogers et al., 2002; Vigil-Colet et al., 2012). Therefore, forensic psychologists should carefully examine the patterns of responses on self-report measures to detect potential signs of social desirability bias (Echeburúa et al., 2011; Spaans et al., 2017).

As far as the Dark Tetrad traits are concerned, although without too much literature on them, there does seem to be some inconsistency as to whether people with these traits present themselves as socially desirable or not (Muris et al., 2017). Specifically, there seems to be inconsistency for all traits, with some studies concluding positive relationships and others concluding negative relationships (Kowalski et al., 2016; Kowalski, Rogoza, et al., 2018; Pineda et al., 2020; Wertag et al., 2023). One paper argued that perhaps the negative relationships between these variables could be because people who score higher on these traits are less concerned about social desirability and therefore show themselves to the world as they are (Kowalski, Rogoza, et al., 2018). This idea has been supported by other works, which have also considered that people with high scores in dark traits can be sincere when they respond to a self-report because of their lack of concern for what other people think of them, only their image and why they give answers in a questionnaire when there are concrete goals or purposes to be achieved (Carré et al., 2020; Fehr et al., 1992; Hare, 1999).

However, a review and meta-analysis that examined the association between the Dark Triad traits and the honesty-humility personality factor of the HEXACO model

(Ashton & Lee, 2007; Howard & Van Zandt, 2020) concluded that all three traits were associated with low levels of sincerity, fairness, greed avoidance and modesty (the four components of the honesty-humility factor), especially Machiavellianism (Muris et al., 2017). More specifically, narcissism was most clearly related to a lack of greed avoidance and modesty, and Machiavellianism and psychopathy to a lack of sincerity and fairness. Therefore, there seems to be inconsistency in the results on this matter.

7. **An alternative to self-report assessment: a methodology based on the objective and indirect assessment of Dark Triad and Dark Tetrad traits. A challenge in psychological assessment.**

Given the authors' concern to mitigate biases in self-report personality assessment, many have included in their studies other more indirect or objective instruments (e.g., Lejuez et al., 2002; Lozano-Bleda et al., 2010; Proyer & Häusler, 2007; Romero et al., 2020). The theoretical and empirical basis for this idea is, on the one hand, that with more indirect and objective measures it is more difficult for respondents to modify their answers, in addition to the fact that they will not know exactly what they are being assessed (Hernández-López et al., 1999; Lozano-Bleda et al., 2010; Rubio et al., 2004; Santacreu & Hernández, 2018). On the other hand, the underpinning of this idea is also that the best psychological assessment will always combine different measurement methods (Kyllonen & Kell, 2018; McDonald, 2008; Ortner & Proyer, 2015; Proyer & Häusler, 2007). Hernandez-López et al. (1999) went so far as to consider that restricting personality assessment to the exclusive use of self-reports is a limiting barrier to good assessment.

To understand the origin of objective instruments in psychological assessment, it is essential to turn to the work of Cattell (Cattell, 1941, 1944, 1946). Cattell y Warburton (1967) distinguished between three different types of data in personality assessment: (1) L-data, coming from the biographical data, i.e., from the behaviour of individuals in natural or controlled situations; (2) Q-data, coming from questionnaires, i.e. self-reports; and (3) T-data, coming from objective tests. After obtaining this classification, they classified L-data and Q-data as more limited. In the first case due to the difficulties in carrying out an adequate systematic observation and in the second case due to the limitations of self-reports already mentioned earlier in this work (Cattell & Kline, 1977; Cattell & Warburton, 1967; Santacreu et al., 2006).

Due to the distinction of T-data and the development of different tests based on these data, the so-called Objective Personality Tests (hereafter OPTs; Ortner & Proyer, 2015) emerged. Cattell y Warburton (1967) defined these tests as:

> Objective means not only that the test performance should be similarly scored by two different psychologists, but also that the test stimulus situation, and the whole mode of response, should be such that the test himself could not fake the response, or distort it to fit his subjective self-concept or his desire. (p. 15)

More specifically, these tests have been characterised by their ability to infer the characteristics of the person being tested by assessing their behaviour in standardised situations, by not relying on self-assessments, by masking their objectives so that the person being tested does not know exactly what they are being tested for, and by being less susceptible to manipulation and misrepresentation compared to Q and L-data (Cattell & Schuerger, 1978; Ortner & Proyer, 2015; Proyer & Häusler, 2007). Following these findings, Cattell and Warburton (1967) designed the first battery of OPTs, which included a total of 400 tests to assess personality and motivation. Several authors have subsequently attempted to validate, version or even computerise some of the tests included in this battery, and other authors have tried to summarise some of these validations and more recent versions in their work (e.g., Kline & Cooper, 1984; Kubinger, 2009; Romero et al., 2020; Santacreu et al., 2006).

To better understand how OPTs work and how they allow personality to be assessed in a more indirect way, it is necessary to understand their relationship to the assessment context. In this sense, OPTs are designed to assess an individual's personality by observing his or her behaviour in specific tests or situational tasks. In other words, these tests allow the personality of individuals to be assessed in terms of how they behave or how they perform in these tests or tasks. This implies that, by assessing a person's behaviours in these varied contexts, his or her personality can be accurately assessed using the variables defined within each context. That is, the assumption is that if people exhibit consistent behaviours in different contexts in which they may act differently according to their personality (e.g., in conditions with different degrees of risk, difficulty, or stress), personality can be assessed through the variables defined in these contexts (e.g., assessing personality through an impulsivity, morality, or risk-taking task) (Furr, 2009; Hernández-López et al., 1999; Kubinger, 2009; Santacreu, 2009; Santacreu & Hernández, 2018).

Based on this, OPTs are defined under the assumption that personality traits are manifested through observable behaviour. Therefore, personality can be measured by assessing behaviour in standardised tasks or situations that directly reflect personality-related characteristics. This is supported by the idea that it is essential to understand the connection between behaviour and personality traits in the context of objective personality assessment (Cattell & Warburton, 1967; McDonald, 2008; Romero et al., 2020). In line with this idea, the variables defined in such contexts are those that would be assessed directly by the measures (e.g., impulsivity) and the personality is that which would be assessed indirectly, knowing its relationship to the variable assessed directly by the measures (e.g., psychopathy) (e.g., Malesza, 2020; Malesza & Kalinowski, 2021b; Moreno-Angel et al., 2000; Romero et al., 2020).

Since the emergence of OPTs there have been several attempts to classify the different tests, but due to variation in their conceptualisation and advances in psychological assessment, there has been little consensus. Thus, on the one hand, the most recent classification has been developed by Ortner and Proyer (2015), who classified these tests into three well-defined and differentiated categories:

(1) OPTs masked as achievement tasks: In this type of test, individuals are required to complete an achievement-based assignment with the primary objective of achieving high accuracy and/or speed, all while remaining unaware of the specific aspects being measured or the scoring mechanism employed. Unlike simulated or hypothetical real-world scenarios, these tests do not incorporate the task within such contexts or situations. Generally, participants are unable to differentiate these tests from conventional cognitive performance assessments. In most instances, greater scores on the underlying construct are associated with more precise or swifter task performance. This suggests that the scoring procedure employed for OPTs may even be dissociated from the explicit task presented in the test itself. An example of such tests is the well-known Emotional Stroop Task (Dawkins & Furnham, 1989), in which participants must name the colours in which words are written, under the assumption that the less interference from emotional stimuli, the greater the accuracy and speed of the test.

(2) OPTs that aim to represent real-life simulations: In these tests, individuals are required to complete tasks that are embedded within authentic or realistic contexts. Although these tests do not explicitly present themselves as pure achievement-based assessments,

participants strive to achieve successful outcomes based on a goal. The specific trait or state being measured is often not explicitly disclosed; instead, the focus lies on evaluating the test takers' behaviour within the given situation as an indicator of a particular personality characteristic. An example of these tests are the experimental games, such as the Balloon Analogue Risk Task (BART; Lejuez et al., 2002), a test designed to measure risk appetite by simulating an environment in which the test taker executes the task in a gambling situation. The objective is to maximize gains by choosing risky options.

(3) Questionnaire-type OPTs that ask for evaluations or decisions: In this type of test, individuals are required to respond to items that resemble questionnaire prompts or requiring them to make evaluative decisions. According to the authors, these tests might appear to fall between objective tests and traditional questionnaires, but they argue that they differ from traditional self-reports in that the constructs being measured diverge from what is implied by the item content. Consequently, such tests are expected to lack face validity. An example of such tests is the Test T328 (Cattell & Warburton, 1967), which requires the person being tested to rate a series of words as emotional, personal, exciting, or neutral, will assess their anxiety based on the idea that highly anxious people will rate fewer words as neutral.

On the other hand, although not framed as OPTs as such, there are other types of tools that the authors have also considered as useful objective or indirect tools to measure personality. One of these is observer-reports (Abernethy, 2015; Connelly & Ones, 2010; Furr, 2009; Luan et al., 2019; McDonald, 2008; Vazire & Carlson, 2011). Based on the findings that observer ratings show a strong association with the personality traits exhibited by the individuals assessed observer-reports emerge as a robust approach to assessing personality (Connelly & Ones, 2010).

Specifically, this assessment methodology has limitations when it comes to observing an individual's internal processes, intentions, or past experiences; however, observer-reports have proven effective as a tool for assessing the traits and performance of observed individuals. In this sense, this methodology can help and complement the collection of data that may be more difficult to obtain with self-reports alone (Abernethy, 2015; Mount et al., 1994; Vazire & Carlson, 2011).

Although they also have limitations, such as those related to inter-rater reliability and observer expectation bias, overall, the results suggest that they can be a good complement

to self-reports (Abernethy, 2015; Connelly & Ones, 2010). Indeed, Durmaz et al. (2020), for example, summarized useful methods that might allow minimizing the socially desirable response projected by self-reports, including observer-reports. In addition, findings indicate that relying exclusively on self-assessments for measuring personality may lead to an underestimation of the true validity of personality constructs (McDonald, 2008; Mount et al., 1994).

Furthermore, research suggests that individuals are more accurate in self-assessment when it comes to low observable traits, whereas individuals are more accurate in observing others when it comes to assessing highly observable traits. That is, when it comes to highly observable traits, assessments by others tend to show greater accuracy compared to self-assessments. This indicates that ratings provided by observers are especially reliable for socially desirable or undesirable traits, such as agreeableness or openness to experience, rather than for neutral traits (Connelly & Ones, 2010; Luan et al., 2019; Vazire, 2010).

Finally, turning to the remaining instruments which, although not framed as OPTs, have also been considered as useful objective tools to measure personality, the following biomedical data or psychophysiological data will be mentioned (Cattell & Warburton, 1967; Kline, 1973; Kline & Cooper, 1984; Miranda-Correa et al., 2021; Ortner & Proyer, 2015; Proyer & Häusler, 2007; Taib et al., 2020; Vinciarelli & Mohammadi, 2014). For this purpose, it is necessary to go back to the T-data and the OPTs battery of Cattell and Warburton (1967) since these already referred to psychophysiological data in the assessment of personality. Specifically, from these designed tests, some 200 variables were derived, some of which measured personality indirectly through psychophysiological data. However, although some of these tests could indirectly affect certain psychophysiological aspects of personality, such as arousal levels or emotional reactivity, the main goal was to measure personality traits rather than to directly assess physiological variables (Cattell & Warburton, 1967; Kline & Cooper, 1984; Ortner & Proyer, 2015).

However, these were initial approximations, and subsequent studies that have included psychophysiological measures in their personality assessments in order to make more objective assessments have concluded that these can accurately detect personality traits (Miranda-Correa et al., 2021; Taib et al., 2020). This idea is based on the assumption that personality traits can also influence physiological responses and the autonomic nervous system, making personality assessment through these responses possible (Vinciarelli &

Mohammadi, 2014). Therefore, in short, although biomedical or psychophysiological measures do not fall under the umbrella of OPTs, they are objective measures that could also complement self-report assessment. In fact, Proyer and Häusler (2007) concluded in their study that OPTs are a good complement to self-reports, but that the inclusion of experimental measures, such as psychophysiological measures, would provide greater validity to the assessment.

At this point, returning to the personality traits of interest in this doctoral thesis, i.e., the Dark Triad and Dark Tetrad traits, it is important to note that quite a few authors have included in their studies objective measures to complement their self-report assessment and thus obtain more objective results by means of indirect assessment of these traits (e.g., Dane et al., 2018; Forsyth et al., 2021; Jonason et al., 2020; Kapoor et al., 2021; Laakasuo et al., 2021; Lämmle et al., 2021; Lämmle & Ziegler, 2021; Malesza & Kaczmarek, 2020; Malesza & Kalinowski, 2021b; Miller et al., 2017; Nicholls et al., 2020; Pajevic et al., 2018; Pfattheicher, 2016; Puthillam, Karandikar, & Kapoor, 2021; South et al., 2023).

Referring again to Ortner and Proyer's (2015) classification, there are several tests that have been used to indirectly measure these dark traits and which, depending on their characteristics, might fit into one of the categories. Among the tests classified in the first category, i.e., OPTs masked as achievement tasks, tests measuring, for example, emotional recognition or cheating behaviour have been used (e.g., Nicholls et al., 2020; Pajevic et al., 2018; Puthillam, Karandikar, & Kapoor, 2021). Among the tests classified in the second category, i.e., OPTs that aim to represent real-life simulations, tests measuring, for example, risky decision making or self-harming behaviour were used (e.g., Jonason et al., 2020; Lämmle & Ziegler, 2021; Malesza & Kalinowski, 2021b). Finally, among the tests belonging to the third category, i.e., Questionnaire-type OPTs that ask for evaluations or decisions, tests measuring utilitarian and unethical decision making or attitude to lie have been used (e.g., Forsyth et al., 2021; Kapoor et al., 2021; Laakasuo et al., 2021).

As for the other types of objective measures discussed in this work, i.e., observer-reports and biomedical or psychophysiological data, both have also been used in numerous studies to indirectly measure these dark traits. As for observer-reports, familiar questionnaires already cited in this work, such as NPI, MACH-IV, SRP, DD, and SD3, modified in the third person have been used to measure the traits of targets through, for example, family and friends (e.g., Lämmle et al., 2021; Malesza & Kaczmarek, 2020; Miller

et al., 2017). Similarly, biomedical or psychophysiological data, such as testosterone or cortisol, have also been used to indirectly measure the Dark Triad and the Dark Tetrad (e.g., Dane et al., 2018; Pfattheicher, 2016; South et al., 2023).

Therefore, it seems that there are many objective measures that could be used in the field of psychological assessment to assess personality in a more objective and indirect way. However, there does not seem to be an agreed classification that categorises all existing objective tools. Nor does there seem to be a clear terminology to refer to them since, for example, Ortner and Proyer's classification (2015) of OPTs includes tests that, given their characteristics, could not be considered as such "tests", but rather "tools" or "measures", such as the BART. Consequently, it seems necessary to carry out a thorough review of the different types of measures and how they could be classified to facilitate their subsequent selection according to the specific nature of the study that needs to be carried out.

In any case, as already discussed, self-reports have many advantages in their use (Abernethy, 2015; McDonald, 2008) and the validated scales for measuring the Dark Triad and Dark Tetrad traits have shown adequate psychometric properties (Jonason & Webster, 2010; Jones & Paulhus, 2014; Paulhus et al., 2021; Pineda et al., 2020, 2021; Plouffe et al., 2017; Webster & Wongsomboon, 2020). Moreover, consistency in the patterns of respondents' answers appears to be similar (around 70 %) in self-reports (Q-data) and OPTs (T-data) (Rubio et al., 2011). Therefore, research has concluded that there is no single assessment method that stands out as the best as different methodologies have their advantages and disadvantages. It has been suggested that the best assessment, i.e. the most accurate assessment, will always be one that combines different assessment methodologies (Kyllonen & Kell, 2018; McDonald, 2008; Ortner & Proyer, 2015; Proyer & Häusler, 2007). Using more than one assessment method to measure the same variable will allow construct validity to be demonstrated, an idea that is supported by the multi-trait-multi-method approach (Campbell & Fiske, 1959; McDonald, 2008).

8. The present doctoral thesis

The objectives of this doctoral thesis have been formulated based on two fundamental foundations. Specifically, we began with the purpose of broadening the understanding of the Dark Triad and Dark Tetrad traits (how they relate to other personality models and other variables of scientific interest) and ended with the main interest of this doctoral thesis: how

to improve their assessment using instruments that complement self-report. The justification for these objectives is detailed below.

8.1. A deepening in the links of dark personality traits with general personality and social behaviour

8.1.1. Association of Dark Triad model and Eysenck's PEN model

On the one hand, our research on dark traits began with the question of why their relationship with the two personality models that followed Eysenck's PEN model had been studied so much (i.e., with the FFN and HEXACO models), but their relationship with this first model had not (e.g., Book et al., 2016; Cheung & Egan, 2021; Fernández-del-Río et al., 2020; Koehn et al., 2019; Lee, 2019; Muris et al., 2022; Nai & Toros, 2020; Oda & Matsumoto-Oda, 2022; Schreyer et al., 2023). Specifically, only a couple of studies were located, which reached different conclusions, so it was of great relevance to provide further evidence for the relationship between dark traits and this general personality model (Mohammadzadeh & Ashouri, 2018; Pineda et al., 2020).

8.1.2. Relationship of Dark Triad with Big Five model and civic engagement

On the other hand, in understanding how these dark traits relate to other outcomes, the interest has also been in understanding their relationship with variables considered positive, such as civic engagement, well-being, EI, or empathy (Bonfá-Araujo et al., 2022; Kircaburun et al., 2019; Pajevic et al., 2018; Pruysers et al., 2019; Schreyer et al., 2023; Szabó & Bereczkei, 2017; Van Groningen et al., 2021; Veselka et al., 2012). In some of these studies, results have shown that narcissism is related differently to these variables than other dark traits. Specifically, narcissism is positively related, and the others are negatively related.

Of all these variables considered positive, one of the variables that has received the least attention is civic engagement. Specifically, only one study was located that previously analysed the relationship between this variable and dark traits (Pruysers et al., 2019). In that study, the association of both more general personality traits and dark traits with civic engagement was analysed, albeit separately.

As argued in the introduction of this doctoral thesis, many studies include both general and dark personality in their studies when they seek to deepen the understanding of

a behavioural variable. Therefore, it was of interest to analyse the relationship between all personality traits (general and dark) and civic engagement in the same model. Indeed, another study that analysed the relationship between the Big Five traits and civic engagement argued that the relationship might be influenced by other variables (Weinschenk, 2017).

8.1.3. Relationship of Dark Triad with EI by means of a person-centred approach

The relationship between EI and dark personality has also attracted interest in recent years. In fact, there has even been talk of a "dark EI" given its relationships with some negative outcomes, such as stress reactivity or even manipulative or antisocial behaviours (Davis & Nichols, 2016; Gentina et al., 2018; Kilduff et al., 2010; Wood, 2020). This has led to the question of whether people with high EI might manifest emotionally manipulative behaviours to achieve self-serving goals (Kilduff et al., 2010).

In this case, unlike civic engagement, the relationship between IE and the Dark Triad traits has received considerable attention in recent years and, likewise, studies have concluded that IE is positively related to narcissism and negatively related to the other dark traits (Hjalmarsson & Dåderman, 2020; Hyde et al., 2020; Nagler et al., 2014; Petrides et al., 2011; Plouffe et al., 2017; Schreyer et al., 2023; Szabó & Bereczkei, 2017; Veselka et al., 2012; Zhang et al., 2015). However, several systematic reviews and metanalysis have concluded that there is either no positive relationship between any of the Dark Triad traits and EI, or a weak positive relationship with narcissism (Miao et al., 2017; Michels & Schulze, 2021; Walker et al., 2021). Therefore, it seems that the debate of whether there is a dark EI and why narcissism is positively related to it is still open. Based on this, the interest in analysing such relationships using a more novel, person-centred methodology (and not variable-centred as in the previous studies cited) was of great interest.

Latent Profile Analysis (LPA) is a novel person-centred approach that distinguishes itself from traditional classification techniques. This innovative methodology enables the identification of distinct groups of individuals based on their scores across multiple scales, while also estimating the likelihood of each person belonging to a specific latent profile. Furthermore, it considers the variability in scores between these profiles. By employing LPA, researchers can classify individuals into homogeneous profiles and subsequently examine variations between these profiles in relation to other variables of interest (Williams & Kibowski, 2015).

8.1.4. Association of Dark Tetrad with online dating and sociosexual orientation

Continuing with the better understanding of dark traits, i.e., how they relate to other variables of scientific interest and their influence on human behaviour, it was also relevant to analyse their relationship with specific behaviours and motivations in contexts of social interactions and personal relationships.

Nowadays people have changed the way they relate to each other and, due to the easy access to the Internet, they have even changed the way they find a romantic partner (Anzani et al., 2018; David & Cambre, 2016; Duguay, 2017; Sumter et al., 2017). Tinder is one of the most widely used apps today, with millions of active users (Duguay, 2017; Sumter & Vandenbosch, 2019). However, studies indicate that users do not only use these apps to find a romantic partner, but also for other purposes, such as having a casual sexual encounter, gaining social approval, making new friends, or entertainment (Phan et al., 2021; Sumter et al., 2017; Sumter & Vandenbosch, 2019; Timmermans et al., 2018; Timmermans & De Caluwé, 2017).

Interestingly, Dark Tetrad traits seem to predict Tinder usage motives in different ways, with the sexual motive seeming to predominate among people with high scores on these traits (Freyth & Batinic, 2021; Lyons et al., 2022; Timmermans et al., 2018). Thus, it has been found that both dark traits and sociosexual orientation (unrestricted sex) seem to play a relevant role in the study of motives for using apps such as Tinder. Moreover, these two variables, i.e., dark traits and sociosexual orientation, are closely related (e.g., Burtaverde, 2021; Lechuga & Jones, 2021; Malesza & Kaczmarek, 2021). However, to date, no study has been located that has jointly analysed the relationship between these three variables, i.e., motives for using Tinder, Dark Tetrad and sociosexual orientation. Again, a person-centred analysis, such as the LPA, was of great interest.

8.2. Assessment methods for dark personality traits

8.2.1. Validity evidence for SD3 + ASP

As discussed in the introduction, Plouffe et al. (2017) were the first to talk about combining two of the main scales, i.e. the SD3 (measuring the Dark Triad; Jones & Paulhus, 2014) and the ASP (measuring sadism; Plouffe et al., 2017), to measure the Dark Tetrad (with a total of 36 items). However, a version of this combination, let alone a short version, was not validated. Although the validated self-reports measuring the Dark Triad and Dark

Tetrad traits have adequate psychometric properties, the question arose as to why a short version measuring these traits had not been validated from the combination of these scales. This combination would also ensure the measurement of the same constructs as those measured by the SD3 and the ASP. For example, Paulhus et al. (2021) proposed the 28-item SD4, which, in order to further distinguish psychopathy from Machiavellianism, further conceptualises the latter by using controlled manipulation rather than aggression; or by paying more attention to the vicarious dimension of sadism. In contrast, a short version of the combination of the SD3 and the ASP would measure the same constructs as the original version of these scales by being based on the same set of items.

8.2.2. The role of indirect measures in the assessment of dark personality traits

Finally, this scientific interest led in turn to a desire to explore whether people with high scores on dark traits were sincere or not in their responses to self-report measures, and thus whether or not they were socially desirable (Ashton & Lee, 2007; Carré et al., 2020; Fehr et al., 1992; Hare, 1999; Howard & Van Zandt, 2020; Kowalski et al., 2016; Kowalski, Rogoza, et al., 2018; Muris et al., 2017; Pineda et al., 2020; Wertag et al., 2023). As discussed in the introduction to this doctoral thesis, the main instrument for measuring the factors of the PEN model, i.e., the EPQR-A, includes a subscale to measure sincerity (Francis et al., 1992). Therefore, given the inconsistence in the literature regarding this issue, and together with the previous research question, it was relevant to also analyse the relationship of traits with this variable.

From this research arose the main interest of this doctoral thesis. First, it is known that people with the highest scores on dark traits might be sincere because, for example, they do not mind presenting themselves to the world as they are, but when they have an interest they might not be so honest (Carré et al., 2020; Fehr et al., 1992; Hare, 1999; Kowalski, Rogoza, et al., 2018). Second, it is also well known that social desirability is especially prevalent when addressing undesirable behaviour and personality (Althubaiti, 2016; Rogers et al., 2002; Tourangeau & Smith, 1996; Vigil-Colet et al., 2012). Finally, self-report has been found to be the most commonly employed assessment methodology in personality measurement, but is itself influenced by social desirability (Durmaz et al., 2020; Kyllonen & Kell, 2018; Proyer & Häusler, 2007; Santacreu et al., 2006). Consequently, the question arose whether there might not be other tools to measure these dark traits in a more objective way. That is, even knowing that validated self-reports to measure these traits have good

psychometric properties, the interest arose in knowing whether there would be other tools that could complement the assessment of self-report and, therefore, offer more reliable and adjusted results.

These research questions focused the main topic of interest of this doctoral thesis: exploring possible improvements in the assessment of dark personality traits. Consequently, the main study of this doctoral thesis involved a comprehensive literature study of all existing objective and indirect measures developed to date to assess these traits, complementing the self-report assessment.

The results of this systematic search led to another scientific interest. That is, the search for such a review included several studies that had used observer-report methodology to measure the dark traits, so the next research question was whether such methodology was indeed valid for assessing them. This concern also arose because only one meta-analysis conducted in 2010 was located that provided evidence for the accuracy of observer-reports in assessing personality (Connelly & Ones, 2010). This study concluded that the ratings of others are a good method for measuring personality as their ratings are clearly linked to the personality traits of the targets. However, this meta-analysis focused on general personality traits (in the Big Five), so no meta-analysis to date has attempted to provide further evidence for this methodology in assessing dark traits.

To carry out this research, two independents but closely related studies were proposed. The first meta-analysis focused on studies that included at least all three traits of the Dark Triad or all four traits of the Dark Tetrad to ensure their assessment as originally conceptualized (Paulhus & Williams, 2002); and the second on studies that assess at least one of the traits independently. Therefore, the distinction between them lay in one of the exclusion criteria. Specifically, in the first version, it was deemed appropriate to use an exclusion criterion that eliminated studies not measuring all three traits of the Dark Triad (i.e., narcissism, Machiavellianism, and psychopathy), thereby including only those studies focused on assessing the dark traits in their original conception (Paulhus & Williams, 2002). However, during the screening process, a significant number of studies were discarded due to this criterion. Additionally, the cumulative sample size of all included studies was relatively small, making it challenging to conduct moderation analyses. Consequently, a second version of the meta-analysis was devised, removing this exclusion criterion to achieve a larger sample size, thereby enabling the inclusion of the informant type as a

moderating variable. Prior research has shown that the accuracy of observer-reports can vary depending on the closeness of the relationship between the target and the observer, making it worthwhile to incorporate this moderating variable in the analyses (Connelly & Ones, 2010; Lämmle et al., 2021; Vazire, 2006; Vazire & Mehl, 2008).

OBJECTIVE

Accordingly, based on the above, the specific objectives of this doctoral thesis were formulated as follows:

Study 1: To analyse the relationships between the dark personality model of the Dark Triad described by Paulhus and Williams (2002) (narcissism, Machiavellianism, and psychopathy) and the PEN model of the general personality described by Eysenck and Eysenck (1975) (psychoticism, extraversion, and neuroticism). In addition, including the relationship with sincerity, a variable included in this second model. All this in a sample of Spaniards.

Study 2: To analyse the relationship between the Dark Triad traits and civic engagement, delving into the difference between this relationship when general personality traits (i.e., the Big Five) are also included in the model and when they are not. In other words, to analyse the relationship between personality traits and civic engagement, delving into the specific contribution of the Dark Triad and controlling for the association with the Big Five in a sample of young Spaniards.

Study 3: To identify latent profiles based on Dark Triad traits and EI factors in a sample of Spanish young adults using LPA. Once the profiles were obtained, the aim was also to analyse the differences between them based on two types of variables of interest for the study: those proposed as possible influences on the positive relationship between narcissism and EI (i.e., self-esteem, prosocial behaviours and low levels of personal distress); and those that have empirically demonstrated both their positive relationship with narcissism and EI (well-being, civic engagement and psychological strengths) and their negative relationship (psychological difficulties-psychopathology).

Study 4: To identify profiles of individuals in terms of their dark traits (i.e., Dark Tetrad) and their orientation towards unrestricted sex (i.e., sociosexual orientation) in a sample of Spaniards. As a second and main objective, to analyse the differences between the profiles found based on the different reasons for using Tinder. Although it was not a primary objective of this doctoral thesis, a scale was also validated to measure the motives for using Tinder given the lack of scales validated in the Spanish population for this purpose.

Study 5: To validate a brief but valid and reliable measure to assess the Dark Tetrad traits of personality (i.e., narcissism, Machiavellianism, psychopathy, and sadism), based on the combination of the SD3 and the ASP, in three samples of Spaniards.

Study 6: To summarise the instruments that have been used to assess the Dark Triad and Dark Tetrad traits in a more indirect way (i.e., different from self-report assessment). In other words, to synthesise all objective measures used to assess characteristics related to these dark traits, thus allowing for their indirect assessment. To this end, a systematic review of studies published up to April 2021 was conducted.

Study 7: To analyse the accuracy of observer-reports in assessing the Dark Triad and Dark Tetrad traits. More specifically, the aim was to analyse the relationship between these traits assessed with self-report and with observer-reports and to calculate effect sizes from the correlations between both types of assessment methodology for each of the four dark traits. For this purpose, two versions of a meta-analysis of studies published up to April 2021 was carried out.

The hypotheses linked to each of the objectives are set out below. In each research we expected to obtain the following results:

Study 1:

H1. Not have specific hypotheses regarding Machiavellianism, apart from its link to psychoticism due to its antisocial nature (Mohammadzadeh & Ashouri, 2018).

H2. Significant positive associations between narcissism and neuroticism, considering the multidimensional nature of narcissism, which encompasses vulnerable and grandiose dimensions (connection based on similarities in high sensitivity and vulnerability to criticism from others) (Curtis & Jones, 2020).

H3. Significant positive associations between all Dark Triad traits and psychoticism (stronger connection with psychopathy due to shared antisocial characteristics) (Mohammadzadeh & Ashouri, 2018).

H4. Individuals with high scores in the three Dark Triad traits to also obtain higher scores on the sincerity subscale due to their disregard for others' opinions, as they may especially manipulate their self-presentation and their

responses on questionnaires when they want to achieve specific goals (Carré et al., 2020; Fehr et al., 1992; Hare, 1999).

Study 2:

H1. A significant relation between civic engagement and narcissism and psychopathy, with a positive association in the former case and a negative association in the latter case; and no significant relation with Machiavellianism (Pruysers et al., 2019).

H2. A significant association between civic engagement and the Big Five traits, with positive relation for all traits except neuroticism, which is expected to have a negative relation (Dinesen et al., 2014; Ha, 2019; Habashi et al., 2016; Omoto et al., 2010; Pruysers et al., 2019; Weinschenk, 2014).

H3. Differences in the strength of the associations with civic engagement when malevolent traits are examined independently versus when they are considered alongside more general personality traits in the same statistical model. The previous literature does not support this latter hypothesis, as this study is the first to address this specific inquiry.

Study 3:

H1. Distinct profiles characterized by varying levels of Dark Triad traits and EI: a profile displaying high levels of Dark Triad traits and low levels of EI, a profile characterized by low levels of Dark Triad traits and high levels of EI, and a profile with low Machiavellianism and psychopathy, high narcissism, and high EI.

H2. Differences among the obtained profiles in relation to the other variables of interest, with the profile exhibiting low Machiavellianism and psychopathy, high narcissism, and high EI exhibiting higher scores on positive variables and lower scores on negative variables.

Study 4:

H1. A shorter but psychometrically valid and reliable Spanish version of the Tinder Motives Scale (TMS; Timmermans & De Caluwé, 2017), maintaining the 13 motives of use of the original scale.

H2. The sample will make use of the 13 different usage motives and not only the motive of seeking a romantic or sexual relationship.

H3. At least two profiles, i.e., one with high scores on dark traits and sexual orientation, and one profile with low scores on both. The previous literature does not support this latter hypothesis, as this study is the first to address this specific inquiry. However, assumptions have been based on the relationships obtained between these variables in previous studies (Freyth & Batinic, 2021; Lyons et al., 2022; Sevi, 2019; Timmermans et al., 2018).

H4. Differences between the profiles and the different motives for using Tinder, with the profile with high scores on dark traits and sexual orientation having especially more sexual, social approval, and distraction and entertainment motives (Freyth & Batinic, 2021; Lyons et al., 2022; Sevi, 2019; Timmermans et al., 2018).

Study 5:

H1. A brief but valid and reliable measure to assess the Dark Tetrad of personality as shown in previous studies using the 36-item version of the combination of SD3 and ASP (e.g., Pineda et al., 2023).

Study 6: Given the nature of the design of this work (systematic review), no starting hypothesis was specified.

Study 7: Given the nature of the design of this work (meta-analysis), no baseline hypothesis was specified.

MATERIALS AND METHODS

Study 1, objective 1. Are the dark personalities sincere? Connections between the Dark Triad and the Big Three

Sample

Initially, a large sample of 4584 individuals was obtained. However, after applying the inclusion criteria (i.e., being above 18 years of age and completing the study measures), the final sample size (*N*) consisted of 2385 participants. Among them, 1727 were women (72.4 %) and 658 were men (27.6 %). The participants had an average age of 28.98 years, with a standard deviation of 10.39. Most of the participants identified as Spanish (85.45 %) or South American (12.70 %). Furthermore, a significant proportion of the participants had attained higher education, with only a small percentage having no formal education (0.15 %), primary school education (8.99 %), high school or vocational training (28.64 %), and the majority having university studies (62.13 %).

Measures

Dark Triad Dirty Dozen (DTDD)

The DTDD (Jonason & Webster, 2010) is a scale designed to assess narcissism, Machiavellianism, and psychopathy using four items for each trait, totalling 12 items. Respondents rate these items on a Likert scale ranging from *strongly disagree* (1) to *strongly agree* (7). The Spanish version of the DTDD was employed in our study (Pineda et al., 2020). In our sample, the internal consistency estimates yielded α (Cronbach's alpha) = .82 and ω (McDonald's Omega) = .83 for narcissism, α = .77 and ω = .79 for Machiavellianism, and α = .64 and ω = .60 for psychopathy.

Abbreviated form of the Revised Eysenck Personality Questionnaire (EPQR-A)

The EPQR-A (Francis et al., 1992) is a personality scale adapted from the EPQ (Eysenck & Eysenck, 1975), which was later translated into Spanish (Sandin et al., 2002). This questionnaire is designed to measure three personality traits: neuroticism, extraversion, and psychoticism. Additionally, it includes a validity scale: sincerity. It consists of 24 items that require dichotomous *yes*/*no* responses. In our sample, the internal consistency estimates were α = .75 and ω = .71 for neuroticism, α = .83 and ω = .84 for extraversion, α = .46 and ω = .50 for psychoticism, and α = .56 and ω = .52 for sincerity.

Procedure and design

A cross-sectional (observational-correlational) study was designed to carry out this study. Over a period of three years, spanning from 2017 to 2019, participants were recruited for this study using a convenience sampling approach, specifically utilizing online platforms such as Twitter, Facebook, and Instagram. The study obtained ethical approval from the Miguel Hernandez University's bioethics committee, ensuring compliance with ethical standards and guidelines (Reference DPS.JPR.04.16).

The data that support the findings of this study are publicly available at https://osf.io/35kqb/. doi: 10.17605/OSF.IO/35KQB.

Data analysis

Firstly, the descriptive statistics and bivariate correlations were performed using the IBM SPSS statistical software (version 23). Secondly, the Structural Equation Modelling (SEM) was carried out, including Confirmatory Factor Analysis (CFA), path modelling, and the determination of the variance explained accounted for in the Dark Triad subscales by the EPQR-A. For this, the Lavaan package within R was utilized. The estimation of parameters in the SEM was carried out using the Diagonally Weighted Least Squares (DWLS) procedure (Hu & Bentler, 1999; Kline, 2011). This method was chosen due to its accuracy and suitability for ordinal data, as it does not rely on the assumption of normality in the distribution.

The path model incorporated the two personality models and included paths from the Eysenck model to the Dark Triad traits. To assess the model fit, several fit indices were utilized whose values had to conform to the following requirements: a Comparative Fit Index (CFI) equal to or greater than 0.95, a Normalized Fit Index (NFI) greater than 0.90, a Goodness of Fit Statistic (GFI) equal to or greater than 0.90, a Root Mean Squared Error Approximation (RMSEA) equal to or less than 0.08, and a Standardized Root Mean Residual (SRMR) equal to or less than 0.05 (acceptable up to 0.08). Additionally, a non-significant chi-square (χ^2) test statistic due to the sample size was indicative of a well-fitting model.

Prior to conducting the analyses, a *t*-test was conducted to examine potential differences in scale means between participants of Spanish origin and participants of South American origin (country variable). However, the results indicated only minor differences on the Machiavellianism and psychopathy subscales. Therefore, it was deemed appropriate to consider the two groups as a single sample and not conduct subsequent analyses

separately. This lack of mean differences may be attributed to variations in sample size and the fact that the country variable pertained to country of origin rather than current residence.

Study 2, objective 2. Civic engagement and personality: Associations with the Big Five and the Dark Triad

Sample

The study included a total of 1175 students, with 683 of them being females (58.1 %). These students were selected from two universities in Spain, namely Miguel Hernandez University of Elche and San Antonio Catholic University of Murcia. The average age of the participants was 20.51 years, with a standard deviation of 2.52 and a range of 17 to 30 years.

To determine the appropriate sample size using convenience sampling, we followed a guideline that suggests allocating several observations 6 to 10 times greater than the variables involved (Velicer & Fava, 1998). Based on this guideline and considering the number of items in the scales administrated the sample size needed ranged between 264 and 440 participants. Ultimately, a total of 1733 participants were initially involved in the study. However, 558 participants were excluded as they did not complete the online survey in its entirety. Consequently, the final sample included 1175 participants.

Measures

Civic Engagement Questionnaire (CEQ)

The CEQ (Pilkauskaite-Valickiene, 2015) is a scale derived from the Positive Youth Development Inventory (PYDI; Arnold et at., 2012). It assesses the perceptions of young individuals regarding their involvement in the community, utilizing a set of seven items. These items reflect aspects such as the importance of making efforts to bring about change in the world and the inclination to collaborate with others to solve problems. Participants rated their responses on a six-point Likert-type scale, ranging from *strongly disagree* (1) to *strongly agree* (6). In the current sample, the CEQ demonstrates good reliability, as indicated by an $\alpha = 0.78$ and an $\omega = 0.79$, like those obtained in the original version of the instrument.

Big Five Inventory-10 (BFI-10)

The BFI-10 (Rammstedt & John, 2007) is a shortened version of the BFI, which originally comprised 44 items. It is designed to measure the five major personality traits (the Big Five; Goldberg, 1990): openness to experience, conscientiousness, extraversion, agreeableness, and neuroticism. Each trait is assessed through two items, capturing aspects such as imaginative thinking, thoroughness in tasks, sociability, trust in others, and

susceptibility to nervousness, respectively. Participants rate their agreement with each item on a 6-point Likert-type scale, ranging from *strongly disagree* (1) to *strongly agree* (6).

The development of the BFI-10 demonstrated that it retains a significant portion of the reliability and validity of the longer BFI-44 instrument (Thalmayer et al., 2011). It exhibits good test-retest reliability and shows external validity and convergent validity with another scale, the NEO-Personality Inventory-Revised (Costa & McCrae, 1992). In the present sample, the inter-item correlations for each trait, obtained through Pearson's correlational analysis, were as follows: openness to experience = 0.31, conscientiousness = 0.21, extraversion = 0.66, agreeableness = 0.03, and neuroticism = 0.50.

Short Dark Triad (SD3)

The SD3 (Jones & Paulhus, 2014) is a self-report questionnaire consisting of 27 items (nine per trait) that assess the three malevolent personality traits of the Dark Triad, i.e., narcissism, Machiavellianism, and psychopathy. Examples of items include statements such as "people see me as a natural leader" for narcissism, "make sure your plans benefit you, not others" for Machiavellianism, and "revenge must be swift and unpleasant" for psychopathy. Participants rate their agreement with each item on a Likert-type scale ranging from *strongly disagree* (0) to *strongly agree* (4).

For this study we used the version adapted to the Spanish population, which showed acceptable internal consistency indices (Pineda et al., 2020), like those obtained in the present sample: $\alpha = 0.64$ for narcissism, $\alpha = 0.79$ for Machiavellianism, and $\alpha = 0.67$ for psychopathy. Additionally, in this sample, acceptable omega coefficients were obtained: $\omega = 0.65$ for narcissism, $\omega = 0.79$ for Machiavellianism, and $\omega = 0.71$ for psychopathy.

Procedure and design

A cross-sectional (observational-correlational) study was designed to carry out this study. Participants were enlisted through the institutional survey outreach, and data collection was carried out utilizing the online platform DetectaWeb (Piqueras et al., 2017). The survey took place during the months of October, November, December, and January in the 2017/2018 academic year. The study received ethical approval from the university's ethics committee (Reference DPS.JPR.03.17) and adhered to the ethical principles outlined in the 1964 Declaration of Helsinki. Prior to participating in the study, all participants provided their informed consent.

Upon accessing the survey link via their mobile phones, tablets, or computers, participants were initially presented with instructions and then requested to provide their consent before proceeding to complete the scales included in the study. The completion of the scales required approximately 20 minutes of their time. Participants did not receive any form of compensation for their involvement in the study.

The Spanish adaptations of the BFI-10 and CEQ were developed following the guidelines set by the International Test Commission (Muñiz et al., 2013). The adaptation process employed an iterative-translation method, which commenced with multiple independent translations of the items. Subsequently, a collaborative committee consisting of translators proficient in the Spanish language and experts in the field of psychological assessment reviewed the translated items to ensure the appropriateness of the adapted version. To ensure the comprehensibility of the items for young individuals, interviews were conducted to assess their understanding.

The data presented in this study are openly available in the OSF repository at:10.17605/OSF.IO/TWUFH,

https://osf.io/twufh/?view_only=f1ee58b3d8e4495bacc81ee7d1c72024.

Data analysis

Initially, descriptive statistics and questionnaire scores were obtained to analyse the characteristics of the study sample. To assess the internal consistency of the CEQ and the SD3, α and ω coefficients were calculated, following the guidelines provided by Kalkbrenner (Kalkbrenner, 2023) for assessing instrument reliability.

Next, correlations were calculated between the variables under investigation. These correlations helped determine the magnitude and direction (positive or negative) of the relationships between the variables. Additionally, a multiple regression analysis was conducted to examine the associations between the dark traits, general personality traits, and civic engagement (the criterion variable). The regression model included three blocks: the first block considered gender as a sociodemographic variable, the second block included the three Dark Triad traits, and the third block involved the Big Five personality traits. Age was not included in the model due to limited variance in the sample, as the age range was restricted to 17 to 30 years. The percentage of total variance explained (sr^2) for each variable was also performed.

Given the large sample size, correlation coefficients and magnitudes of association in the regression model were interpreted after applying Bonferroni correction to obtain more accurate results. The significance level for detecting an effect was set at $p < 0.0056$, which resulted from dividing the α value (0.05) by the number of analyses conducted (nine in total). The data were analysed using the statistical programs SPSS (version 25) and Jamovi (version 2.2.5).

Study 3, objective 3. The connection between Dark Triad and Emotional Intelligence traits: A multi-study person-centred approach

Sample

The study included a total of 1241 emerging adults from Spain, with 719 of them being female (57.9 %). These participants were pursuing various degrees and were at different academic stages, representing two universities located in the eastern region of Spain (Miguel Hernandez University of Elche and San Antonio Catholic University of Murcia). The average age of the participants was 20.51 years, with a standard deviation of 2.51, and an age range from 17 to 30 years. The sample size for this study was determined using the same criteria as in Study 2.

Measures

Short Dark Triad (SD3)

The SD3 (Jones & Paulhus, 2014) is a self-report questionnaire comprising 27 items designed to assess the three personality traits of the Dark Triad: narcissism, Machiavellianism, and psychopathy. Each of these traits is measured by nine items, which participants rate on a Likert scale ranging from *strongly disagree* (0) to *strongly agree* (4). In this study, the Spanish version of the SD3 was employed, which has undergone prior validation and demonstrated favourable reliability. Specifically, the instrument exhibited acceptable α coefficients for each trait: α = .61 for narcissism, α = .73 for Machiavellianism, α = .68 for psychopathy (Pineda et al., 2020).

Trait Emotional Intelligence Questionnaire-Short Form (TEIQue-SF)

The TEIQue-SF (Petrides, 2009) is a self-report questionnaire that assesses EI and its four subscales: emotionality, self-control, sociability, and well-being. It consists of 30 items, and participants rate their agreement on a 7-point Likert-type scale, ranging from *strongly disagree* (1) to *strongly agree* (7). For this study, the Spanish version was used. Previous research has demonstrated that this short version exhibits an excellent fit to the theoretical four-factor structure, as evidenced by statistical indicators such as $\chi^2 = 6.29$, $p = .002$, CFI = .99, Tucker–Lewis index (TLI) = .98, Incremental Fit Index (IFI) = .99, RMSEA = .05 (90 % CI: .03, .08), and SRMR = .02 (Laborde et al., 2016).

Rosenberg Self-Esteem Scale (RSE)

The RSE (Rosenberg, 1965) is a concise self-report measure designed to evaluate self-esteem, which refers to an individual's positive or negative perception of oneself. It categorizes individuals into three groups (high, medium, and low self-esteem) based on responses to 10 items. Participants rate their agreement on a 4-point Likert-type scale, ranging from *strongly disagree* (1) to *strongly agree* (4). The scale has been adapted to the Spanish population and demonstrates satisfactory psychometric properties, with an α = .84, indicating good internal consistency (Martín-Albo et al., 2007).

Strengths and Difficulties Questionnaire (SDQ)

The SDQ (Goodman, 1997) is a self-report measure consisting of 25 items that assess five subscales: emotional symptoms, peer problems, conduct problems, hyperactivity, and prosocial behaviour. The prosocial behaviour subscale assesses strengths, while the remaining four subscales measure difficulties. For the purposes of this study, we focused on the prosocial behaviour score (representing strengths) and the total difficulties score (reflecting the sum of the other four subscales). The Spanish version of the SDQ was obtained from the official SDQ website (www.sdqinfo.org) with permission from www.youthinmind.com. In this version, participants responded on a 3-point Likert-type scale, ranging from *not true* (0) to *true* (2). The adaptation of this scale with a Spanish sample has demonstrated adequate psychometric properties, as indicated by α ranging from .69 to .78 for the different subscales (Ortuño-Sierra et al., 2015).

Social-Emotional Distress Survey (SEDS-S)

The SEDS-S (Dowdy et al., 2018) is a questionnaire designed to screen well-being and distress. It comprises 10 items that participants respond to on a 4-point Likert-type scale, ranging from *completely false* (1) to *very true* (5). In the original validation study conducted with two separate samples of high school students, good internal consistency indices were obtained, with ω = .91 in both samples. As of now, there is no existing Spanish validation of the scale. Therefore, the questionnaire was translated into Spanish using an appropriate translation method outlined in the research procedure.

Mental Health Continuum Short Form (MHC-SF)

The MHC-SF (Keyes, 2009) is a self-report questionnaire comprising 14 items that assess emotional, psychological, and social well-being, in addition to providing an overall well-being score. Participants indicate their feelings over the past month using a 5-point

Likert-type scale ranging from *never* (1) to *everyday* (5). The Spanish version of the MHC-SF, which was employed in this study, has demonstrated favourable psychometric properties. Specifically, α ranged between .86 and .93 for the three subscales, and .94 for the total score. Additionally, ω ranged between .85 and .91 for the subscales, and .95 for the total score (Echeverría et al., 2017).

Civic Engagement Questionnaire (CEQ)

The CEQ (Pilkauskaite-Valickiene, 2015) is a concise subscale derived from the Positive Youth Development Inventory (PYDI; Arnold et at., 2012). It aims to assess the general perception of young individuals regarding their contribution to the community. The scale comprises seven items that participants rate on a 6-point Likert-type scale, ranging from *strongly disagree* (1) to *strongly agree* (6). The original version of the scale demonstrates satisfactory reliability, indicated by an acceptable alpha coefficient (α = .82). For this study, the instrument was translated into Spanish using an appropriate translation methodology outlined in the procedure.

Procedure and design

A cross-sectional (observational-correlational) study was designed to carry out this study. Data were gathered throughout the 2017/2018 academic year, spanning the months of October, November, December, and January. The data collection process involved the administration of a survey via the online platform DetectaWeb (Piqueras et al., 2017). Participants were recruited through institutional outreach, and prior to their participation, they were required to provide informed consent to ensure compliance with ethical standards. The research project obtained approval from the university's ethics committee (Reference DPS.JPR.03.17) prior to the survey's release.

To adapt the Spanish versions of the CEQ and the SEDS-S, the guidelines set forth by the International Test Commission were followed (Muñiz et al., 2013). The adaptation process involved an iterative translation method. Initially, multiple independent translations were conducted. Subsequently, a collaborative committee consisting of translators knowledgeable in the Spanish language and culture, as well as specialists in psychological assessment, reviewed these translations. Their role was to evaluate the appropriateness of the adapted versions. Finally, interviews were conducted to ensure that the items were well understood by the young participants, thereby confirming their comprehension.

Data analysis

Firstly, to provide a comprehensive overview of the sample characteristics, descriptive statistics were computed, including means of scores obtained on the main scales of interest for this study, i.e., SD3 and TEIQue-SF. Reliability analyses were also conducted by calculating α and ω coefficients, following the recommendations of Kalkbrenner (2023), and bivariate correlations were examined to explore associations between the Dark Triad traits, EI factors, and the other variables of interest in the study. IBM SPSS (version 23) and Jamovi (version 1.6.23) statistical software were utilized for these analyses.

Secondly, LPA was performed to identify profiles based on scores from seven variables: the three Dark Triad traits and the four EI factors. The goal was to identify distinct groups of individuals exhibiting similar response patterns across these variables. Fit indices, including Bayesian Information Criterion (BIC), Akaike Information Criterion (AIC), sample size adjusted BIC (SSA-BIC), entropy, Vuong-Lo-Mendel-Rubin (VLMR), and adjusted Likelihood Ratio Test (adjusted LRT) were calculated to determine the optimal profile model. The selection criteria considered statistical significance of VLMR and adjusted LRT p-values, entropy values close to 1, and smaller AIC, BIC, and SSA-BIC values indicating better model fit with the highest number of profiles. Additionally, the Elbow Graph was generated using BIC, AIC, and SSA-BIC values to visually identify the best solution. The statistical program Mplus (version 8.7) was employed for this analysis.

Finally, a multivariate analysis of variance (MANOVA) was conducted to examine differences between the profiles obtained above and the other variables of interest, i.e., self-esteem, psychological strengths and difficulties, personal distress, well-being, and civic engagement. IBM SPSS statistical software (version 23) was used for this analysis.

Study 4, objective 4. Unveiling the depths of Tinder: Decoding the Dark Tetrad and sociosexuality in motives behind online dating

Sample

For the first study, i.e., the validation of a short version of the TMS, a total of 234 Spanish participants, ranging in age from 18 to 66 years ($M = 30.58$, $SD = 7.72$), were recruited for the study, meeting the minimum required sample size of 200 participants (Kline, 2011). Among the participants, 67.90 % were women ($n = 159$). Regarding marital status, the majority were single (62.40 %; $n = 146$) or cohabitating without legal recognition (23.10 %; $n = 54$). In terms of education, the highest proportion had a bachelor's degree (38 %; $n = 89$), followed by vocational training (20.50 %; $n = 48$), and master's degree, specialization, or university expert (20.10 %; $n = 47$). Regarding employment status, 52.60 % of the sample were employed full-time ($n = 123$), and 22.60 % were students ($n = 53$). To be eligible for participation, individuals had to be at least 18 years old and have previous or current experience using the dating app Tinder.

For the second study, i.e., the identification of profiles in terms of the Dark Tetrad and the orientation towards unrestricted sex, and the analysis of the differences between them based on the Tinder use motives, the participants were the same as in the first study. However, 34 participants were excluded due to incomplete responses on the scales relevant to this second study. Therefore, the final sample consisted of 200 participants, who shared the same socio-demographic characteristics as those in the first study, i.e., they had a mean age of 30.78 ($SD = 7.99$), and there was a representation of 67.50 % females.

In this second study, to determine the required sample size for our primary outcome, which involved examining differences in Tinder use motives across profiles, we conducted an a priori power analysis using G*Power (version 3.1.9.7). Our aim was to achieve 80 % power with an α level of .05. To estimate the effect size, we considered the recommendations from two studies. One study proposed an effect size of $d = .22$ for relationship-focused studies (Richard et al., 2003), while the other study suggested an effect size of $d = .30$ for ANOVA analyses in fixed effect, omnibus, one-way designs (Uakarn et al., 2021). Based on these recommendations, the power analyses indicated that a minimum sample size of $N = 166$ and $N = 90$, respectively, was required for the present study.

Measures

The following measures were used for the first study:

Tinder Motives Scale-Short Form (TMS-SF)

The TMS (Timmermans & De Caluwé, 2017) is a comprehensive scale consisting of 58 items designed to measure motives for using the dating app Tinder. The scale encompasses 13 distinct variables, each corresponding to a specific reason for app usage. The variables include social approval (e.g., "to see how desirable I am"; 6 items; $\alpha = .91$), relationship seeking (e.g., "to find someone for a serious relationship"; 5 items; $\alpha = .93$), sexual experience (e.g., "to find a one-night-stand"; 6 items; $\alpha = .91$), flirting/social skills (e.g., "because it is hard to talk to people in real life"; 6 items; $\alpha = .86$), travelling (e.g., "to meet other travellers/locals when in a foreign country"; 5 items; $\alpha = .95$), ex (e.g., "to think less about my ex"; 3 items; $\alpha = .95$), belongingness (e.g., "because everyone uses Tinder"; 4 items; $\alpha = .74$), peer pressure (e.g., "because my friends thought I should use Tinder"; 3 items; $\alpha = .70$), socializing (e.g., "to make new friends"; 4 items; $\alpha = .85$), sexual orientation (e.g., "to meet singles with a similar sexual orientation"; 3 items; $\alpha = .91$), pass time/entertainment (e.g., "for fun"; 7 items; $\alpha = .90$), distraction (e.g., "as a break at work or during a study period"; 3 items; $\alpha = .80$), and curiosity (e.g., "to see what the application is about"; 3 items; $\alpha = .77$). The α presented here correspond to the internal consistency indices of the original validation version. Respondents rate each item on a 7-point Likert-type scale, ranging from *strongly disagree* (1) to *strongly agree* (7).

Tinder use and outcomes (ad hoc)

As was done in the TMS validation study (Timmermans & De Caluwé, 2017), in this study we also asked participants about their usage of the Tinder app. They were specifically asked to indicate the frequency of their app usage, with response options on a 7-point Likert-type scale, ranging from *almost never* (1) to *several times a day* (7). Additionally, participants were queried about the number of face-to-face meetings they had with other Tinder users. They were then asked to report the number of individuals they met in person who fell into various categories: (1) individuals with whom they had a romantic relationship, (2) individuals they had kissed, (3) individuals with whom they had engaged in sexual activity, (4) individuals with whom they had a casual sexual relationship, and (5) individuals who had become friends. Responses to these questions were provided as open-ended numerical values.

The following measures were used for the second study:

Tinder Motives Scale-Short Form (TMS-SF)

For the second study we used the TMF-SF, which was validated in the first study and which is derived from the original 58-item scale developed by Timmermans and De Caluwé (2017). It was employed in this study to assess motives for using Tinder. The TMS-SF comprises 39 items and encompasses the same 13 variables as the original scale, capturing the 13 reasons individuals have for utilizing the app. Respondents also rate each item on a 7-point Likert-type scale, ranging from *strongly disagree* (1) to *strongly agree* (7).

Short Dark Triad (SD3)

The SD3 (Jones & Paulhus, 2014) is a scale comprising 27 items that aims to evaluate the three personality traits of the Dark Triad: narcissism, Machiavellianism, and psychopathy. Each trait is represented by nine items, which participants rate on a Likert-type scale ranging from *strongly disagree* (0) to *strongly agree* (4). In the Spanish validation study, acceptable psychometric properties were found, with α values of .61 for narcissism, .73 for Machiavellianism, and .68 for psychopathy (Pineda et al., 2020).

Assessment of Sadistic Personality (ASP)

The ASP (Plouffe et al., 2017) is a concise scale designed to measure everyday sadism. It consists of nine items that participants rate on a Likert-type scale ranging from *strongly disagree* (0) to *strongly agree* (4). The scale was validated using a Spanish sample, and adequate internal consistency indices were obtained, with a α coefficient of .75 (Pineda et al., 2021).

Revised Sociosexual Orientation Inventory (SOI-R)

The SOI-R (Penke & Asendorpf, 2008) is a scale consisting of nine items that assess three dimensions of sociosexuality, which refers to an individual's orientation towards unrestricted sex. Each dimension includes three items, representing sociosexual behaviour (e.g., "How many different people have you had sex with without being interested in a serious long-term relationship?"), attitudes towards sociosexuality (e.g., "Sex without love is OK"), and desire to have relationships without commitment (e.g., "How often do you have a sexual arousal when you come into contact with a person with whom you are not in a serious romantic relationship?"). Participants rate their responses on a 9-point Likert-type

scale. The first-dimension ranges from *0 partners* to *20 or more partners*, the second-dimension ranges from *strongly disagree* (1) to *strongly agree* (9), and the third-dimension ranges from *never* (1) to *at least once a day* (9). The scale has been validated with a Spanish sample, demonstrating good psychometric properties, with α coefficients of .93 for behaviour, .82 for attitudes, and .84 for desire (Barrada et al., 2018) .

Procedure

As the sample was the same for both studies, the procedure was also the same. Participants were recruited through convenience sampling by disseminating the survey on various social networks, including Twitter, Facebook, and Instagram. The survey was created using the LimeSurvey platform (https://www.limesurvey.org/es/) and included the assessment of the variables from both the first study and the second study. The study was conducted with the approval of the university's ethics committee (Reference DPS.JPR.02.20), and all participants provided their informed consent to participate. To validate and adapt the scale to the Spanish language, the guidelines of the International Test Commission were followed. The process involved an iterative translation method, which included independent translations followed by the revision of these translations by a committee of translators (Muñiz et al., 2013).

The syntax and data of this study are available in the OSF repository by following the link below: https://osf.io/34df8/?view_only=7d2ebeea84634e06a2daa0ae00cd4438.

Data analysis

For the first study, a CFA to develop a condensed version of the TMS scale was conducted. DWLS was employed to accurately estimate the factor loadings. The model fit was assessed based on several criteria: χ^2 value being significant ($p < .05$), NFI exceeding .90, CFI reaching .95 or higher, GFI being .90 or higher, SRMR being .05 or less, and RMSEA being .08 or less (Hu & Bentler, 1999; Kline, 2011). These analyses were conducted using the R statistical program (R Core Team).

Descriptive statistics including means and standard deviations were calculated for the new abbreviated version of the TMS scale. Internal consistencies were assessed using α, ω, and the Composite Reliability (CR) index. Convergent and discriminant validity were also evaluated by examining the Average Variance Extracted (AVE) values and the correlations between the 13 variables. An AVE value above .50 indicated high convergent

validity, a CR value above .70 indicated high internal consistency, and correlations below .70 between variables indicated good discriminant validity (Cheung & Wang, 2017; Fornell & Larcker, 1981; Netemeyer et al., 2003).

In addition, construct validity was investigated by calculating Pearson's bivariate correlations (r) between the new scale and Tinder use and outcomes, as in the original validation study (Timmermans & De Caluwé, 2017). However, for variables with a non-normal distribution indicated by a standard deviation greater than the mean, Kendall's Tau-b correlations were computed to ensure robust results (Newson, 2002). SPSS (version 25) and Jamovi (version 2.2.5) were used for these analyses.

For the second study, firstly, descriptive statistics, internal consistency indices, and correlations were computed to provide an overview of the study sample. IBM SPSS (version 23) and Jamovi (version 1.6.23) were used for these analyses. These results are presented in the Appendices section (Appendix 4, Table A.2).

Secondly, LPA was conducted to examine the distribution of participants based on their dark personality traits and sociosexual orientation. The four Dark Tetrad traits measured by the SD3 and ASP, as well as the three unrestricted sex orientation variables assessed by the SOI-R, were utilized to derive the profiles. Standard scores were obtained for all variables to minimize the impact of measurement errors before conducting the LPA (Justice et al., 2011). Models ranging from one to eight profiles were evaluated, and the optimal number of profiles was determined based on the combination of several criteria. These criteria included significant values on the LRT at $p \le .05$, smaller values for LL, AIC, and SSA-BIC, entropy values close to 1, and each profile representing at least 5 % of the participants to ensure distinctiveness (Marsh et al., 2009; Morin et al., 2016).

Thirdly, although not initially hypothesized, Odds Ratios (OR) were estimated to examine the likelihood of belonging to different profiles based on sex due to the sample size and the over-representation of women obtained after data collection. Logistic regression analysis using the three-step method (R3STEP function) was employed for this analysis.

Finally, a multivariate analysis of variance (ANOVA) was conducted to assess the differences in Tinder use motives among the profiles identified by the LPA. The 13 motives measured by the TMS-SF were used for this analysis. Mplus (version 8.7) was used for the

LPA, logistic regression, and ANOVA. The BCH method was applied during the ANOVA to obtain adjusted results (Asparouhov & Muthén, 2014).

Study 5, objective 5. The Dirty Twenty: A brief Spanish measure for assessing the Dark Tetrad of personality

Sample

The first study sample consisted of 1188 Spanish participants. The average age of them was 29.30 years (SD = 10.26), and the age range varied from 13 to 69 years. Among the participants, 78.10 % (n = 928) identified themselves as women. Although a portion of the sample (10.77 %) were not born in Spain, all of them were proficient in the Spanish language. Most participants (n = 734; 61.80 %) had completed university-level studies.

The second study sample consisted of 76 Spanish participants. In this case, the average age of them was 20.07 years (SD = 3.83), and the age range varied from 18 to 38 years. Of these, 26.3 % (n = 20) identified themselves as women and all of them were undergraduate university students.

Finally, the third study sample consisted of 194 Spanish participants. They had a mean age of 27.57 years (SD = 12.66) and their ages ranged from 18 to 71 years. Among the participants, 70.60 % (n = 137) were women. Regarding marital status, the majority were either single (n = 78; 40.20 %) or formed a non-legally recognized partnership (n = 70; 36.10 %). Approximately half of the sample had completed at least high school education (n = 99; 51 %), and most of them were students (n = 117; 60.30 %).

Measures

The following measures were used for the first study:

Short Dark Triad (SD3) and Assessment of Sadistic Personality (ASP)

The SD3 (Jones & Paulhus, 2014) is a 27-item questionnaire that evaluates the three dimensions of the Dark Triad: narcissism, Machiavellianism, and psychopathy. On the other hand, the ASP (Plouffe et al., 2017) is a 9-item scale that measures everyday sadism. By combining these two scales (Plouffe et al., 2017), a comprehensive measure of the Dark Tetrad traits (narcissism, Machiavellianism, psychopathy, and sadism) is formed, consisting of 36 items with nine items per factor. Participants rate their agreement on a 5-point Likert scale, ranging from *strongly disagree* (0) to *strongly agree* (4). The Spanish versions of both the SD3 and the ASP show acceptable psychometric properties, with α of .61, .73, .68, and .75 for narcissism, Machiavellianism, psychopathy, and sadism, respectively. ω are also

acceptable, with values of .60, .69, .65, and .75 for narcissism, Machiavellianism, psychopathy, and sadism, respectively (Pineda et al., 2020, 2021). The combination of these self-reports to assess the Dark Tetrad has been widely employed in studies involving Spanish samples (e.g., Fernández del Río et al., 2019; Pineda et al., 2021; Pineda, Rico-Bordera, et al., 2022).

Dark Triad Dirty Dozen (DTDD)

The DTDD (Jonason & Webster, 2010) is scale that, like the SD3, evaluates the three dimensions of the Dark Triad: narcissism, Machiavellianism, and psychopathy. It consists of 12 items, with four items dedicated to each trait. Respondents rate their agreement on a 5-point Likert scale, ranging from *strongly disagree* (0) to *strongly agree* (4). The Spanish version of the scale demonstrates satisfactory psychometric properties, with a α of .81 and a ω of .82 for narcissism. For Machiavellianism, the scale shows a α and ω of .74. However, for psychopathy, the scale exhibits a α of .60 and a ω of .47 (Pineda et al., 2020).

Short Sadistic Impulse Scale (SISS)

The SISS (O'Meara et al., 2011) is a self-report specifically developed to evaluate the propensity for sadistic impulses. It consists of a single scale comprising 10 items, and respondents provide their ratings using a 5-point Likert-type scale, ranging from *strongly disagree* (0) to *strongly agree* (4). Their Spanish version demonstrates favourable internal consistency measures, with a α of .78 and a ω of .76 (Pineda et al., 2021).

HEXACO-60 Personality Inventory-Revised (HEXACO-60)

The HEXACO (Ashton & Lee, 2009) is a questionnaire designed to assess the six primary dimensions of personality, namely honesty-humility, openness to experience, conscientiousness, extraversion, agreeableness, and neuroticism. It consists of a total of 60 items, with 10 items dedicated to each dimension. Participants indicate their responses on a 5-point Likert-type scale, ranging from *strongly disagree* (1) to *strongly agree* (5). The Spanish adaptation of the 100-item version of the HEXACO scale demonstrated satisfactory psychometric properties, with α ranging between .77 and .84 for the subscales (Roncero-Sanchís et al., 2013). For the purposes of this study, the 60-item version of the scale, translated by Belloch and available online (https://hexaco.org/downloads/Spanish_self60_Belloch.doc), was utilized.

Strengths and Difficulties Questionnaire (SDQ)

The SDQ (Goodman, 1997) is a measure used to assess emotional and behavioural characteristics by evaluating strengths and difficulties across five domains: emotional symptoms, conduct problems, hyperactivity/inattention, peer relationship problems, and prosocial behaviour (which represents strengths). The scale consists of 25 items, with five items corresponding to each domain. Participants rate their responses on a 3-point Likert-type scale, where 0 indicates *not true*, 1 indicates *somewhat true*, and 2 indicates *certainly true*. In this study, their Spanish version, obtained from the official website of the scale (https://www.sdqinfo.org/a0.html), was utilized. This version has been previously employed with a Spanish sample and demonstrated acceptable psychometric properties, with α ranging between .69 and .78 (Ortuño-Sierra et al., 2015).

The following measures were used for the second study:

Short Dark Triad (SD3) and Assessment of Sadistic Personality (ASP)

The Spanish versions of the SD3 (Jones & Paulhus, 2014) and ASP (Plouffe et al., 2017) were administered again in this study (Pineda et al., 2020, 2021). Based on the results obtained in Study 1, these scales were combined to create the D20, consisting of 20 items.

The following measures were used for the third study:

Dirty Twenty (D20)

The D20, which was validated in the first study, was administered to the third sample. The reliability indices obtained for this sample were as follows: narcissism with α = .63 and ω = .67; Machiavellianism with α = .77 and ω = .77; psychopathy with α = .75 and ω = .76; and sadism with α = .89 and ω = .90.

Short Dark Tetrad (SD4)

The SD4 (Paulhus et al., 2021) is a scale consisting of 28 items that measures the four traits of the Dark Tetrad: narcissism, Machiavellianism, psychopathy, and sadism. Each factor includes seven items, and participants respond on a 5-point Likert-type scale ranging from *strongly disagree* (0) to *strongly agree* (4). Although the Spanish version of the scale has not been formally validated, it has been adapted for use in this language and has demonstrated satisfactory psychometric properties. Specifically, for narcissism, the scale

yielded an α = .73; for Machiavellianism, an α = .75; for psychopathy, an α = .65; and for sadism, an α = .78 (Ortet-Walker et al., 2021, 2022). In the present sample, the reliability indices were as follows: narcissism with α = .75 and ω = .76; Machiavellianism with α = .65 and ω = .66; psychopathy with α = .76 and ω = .77; and sadism with α = .79 and ω = .79.

Procedure and design

In all three studies, participants were recruited using the convenience sampling method. Only for the first study was it considered that there were several observations 6 to 10 times larger than the variables when determining the sample size (Velicer & Fava, 1998). Consequently, the required sample ranged from 942 to 1570 participants.

Specifically, during the month of December 2019, the participants of the first study were recruited; during February (for the test, i.e., the first collection) and May (for the retest, i.e., the second collection) of 2023, the participants of the second study were recruited; and during June 2023, the participants of the third study were recruited. For all cases, the different surveys were disseminated through social networks such as Instagram, Facebook, and Twitter. Participants in the first and third studies did not receive any compensation for their participation. In contrast, in the second study, their participation was considered when determining the grade for participation in a university subject.

In each of the three studies, participants were required to give informed consent to participate. In addition, all three studies received ethical approval from the Miguel Hernández University's Project Evaluation Committee to be carried out (DPS.JPR.04.16 for the first study; DPS.JPR.02.20 for the second study; and TFG.GPS.DPS.VGG.230310 for the third study).

Data analysis

Firstly, for the first study, CFA was conducted using the R statistical program (R Core Team) with DWLS as the estimation method. The model fit was evaluated using several fit indices: a significant χ^2 value ($p < .05$), NFI greater than .90, CFI greater than or equal to .95, GFI greater than or equal to .90, SRMR equal to or less than .05, and RMSEA equal to or less than .08 (Hu & Bentler, 1999; Kline, 2011).

Descriptive statistics (mean and standard deviation), gender differences (Student's t-test), and Pearson correlations were computed using the SPSS statistical program (version

25). Cohen's *d* was calculated to determine effect sizes for gender differences, and an online program (https://www.easycalculation.com/es/statistics/effect-size.php) was employed for this purpose. Bonferroni correction was applied to interpret the significance of Student's *t*-test more accurately ($p < .0125$, considering the α level of .05 divided by the number of analyses performed, i.e., four). Cronbach's Alpha and McDonald's Omega reliability indices were obtained using the Jamovi program (version 2.2.5). To analyse factorial invariance across gender, fit indices including χ^2, CFI, ΔCFI (Difference in Comparative Fit Index), RMSEA, ΔRMSEA (Difference in Root Mean Square Error Approximation), and degrees of freedom (df) were calculated using the R program.

Secondly, for the second study, the statistical program SPSS (version 25) was utilized to analyse the Intra-Class Correlation (ICC), which assesses the test-retest reliability of two versions of the Dark Tetrad instrument: the 20-item D20 and the 36-item SD3 + ASP. The ICC value was obtained using a two-way mixed-effects model, with random effects for persons and fixed effects for measures. This analysis required a sample size of only 30 participants, ensuring accurate results and the ICC value was reported with a 95 % confidence interval. ICC values below .50 indicate poor reliability, values between .50 and .75 indicate moderate reliability, values between .75 and .90 indicate good reliability, and values above .90 indicate excellent reliability, considering the confidence intervals (Koo & Li, 2016).

Thirdly, for the third study, descriptive data and reliability indices (α and ω) were computed using SPSS (version 25) and Jamovi (version 2.2.5) statistical software. Additionally, the convergent validity of the scales was assessed through Pearson's bivariate correlations using SPSS (version 25).

Study 6, objective 6. Objective and indirect assessment instruments of the Dark Triad and Dark Tetrad 20 years later: a systematic review

Search strategy and study selection

In April 2021, the comprehensive search was conducted in the electronic databases of PsycINFO, Web of Science, PubMed, and Scopus to identify all studies of interest. The search terms employed were carefully selected to align with the study's objectives and included "Dark Triad," "Dark Tetrad," "Dark traits," "Narcissism," "Machiavellianism," and "Psychopathy." To ensure the inclusiveness of the search, the following search string was used: ("Dark Triad" OR "Dark Tetrad" OR "Dark traits") OR ("Narcissism" AND "Machiavellianism" AND "Psychopathy").

Inclusion and exclusion criteria

This systematic review aimed to identify objective assessment instruments used to measure constructs related to the Dark Triad or Dark Tetrad traits, as originally conceptualized by Paulhus and Williams (2002). For this reason, to be included in the study, research needed to assess at least the three Dark Triad traits (i.e., narcissism, Machiavellianism, and psychopathy). Studies that only assessed one or two traits were excluded. This was done for two reasons: firstly, the aim was to measure these dark traits as they were originally conceptualised, as discussed. Moreover, as several authors have pointed out, these traits should be studied together because of their similarities (Paulhus, 2014; Paulhus et al., 2021). Therefore, it was decided that at a minimum all three traits of the Dark Triad should be assessed; secondly, if the search equation allowed for the inclusion of all four traits assessed independently, it would yield a very unwieldy number of papers, since it would include works that would also have measured each trait individually. However, we did include studies that did not report any data on the relationship or studies that reported results for only some of the traits but in both cases did administer a self-report questionnaire measuring all traits of the Dark Triad or Dark Tetrad, as they would be measuring the overall set of dark traits as originally conceived.

For the same reason, studies that subdivided the traits into sub-factors (e.g., primary psychopathy and secondary psychopathy) were excluded, as this deviated from the original conceptualization (Paulhus & Williams, 2002). However, if a study assessed vulnerable

narcissism and grandiose narcissism, the latter was considered valid since it corresponds to Dark Triad narcissism (Jones & Paulhus, 2014).

Therefore, to achieve the objective set out in this work, this systematic review focused on studies that measured Dark Triad or Dark Tetrad traits using self-report questionnaires and that, in turn, also employed objective measures to evaluate any characteristics that could be associated with Dark Triad or Dark Tetrad traits, such as risk-taking, impulsivity, or moral judgment (Cattell & Warburton, 1967; Furr, 2009; Hernández-López et al., 1999; Kubinger, 2009; McDonald, 2008; Santacreu, 2009; Santacreu & Hernández, 2018). The search encompassed all relevant studies published since 2002, the year when the Dark Triad framework was introduced by Paulhus and Williams (2002).

Taking into account all the above, the inclusion criteria for eligible research were as follows: (1) unique studies without duplicates, (2) research dealing with the Dark Triad or Dark Tetrad traits, (3) papers written in English or Spanish, (4) any type of complete study available for reading, (5) primary research (excluding narratives, reviews, meta-analyses, or umbrella-review), (6) measurement of at least three of the four traits, i.e., the Dark Triad, (7) absence of subdivision of factors into subfactors (e.g., psychopathy and not subtypes of psychopathy), (8) assess the traits and not just the Dark Trait set (i.e., do not report a Dark Triad score without providing a Dark Triad trait score), (9) administration of self-report questionnaires to assess the dark traits, and (10) use of objective measures to assess characteristics related to the dark traits.

Data extraction

First, researchers downloaded all the studies identified in the various databases into a reference manager tool (Zotero) to manage the references. After removing duplicates, the remaining papers were transferred to an Excel archive.

Next, two screening phases were conducted. In the first phase, the titles and abstracts of all papers were carefully read to exclude those that did not meet the inclusion criteria. In case of uncertainty, the papers were included for further assessment. Two independent reviewers initially screened 10 % of the studies, and after establishing agreement between them, each reviewer screened 50 % of the remaining studies. This resulted in the selection of 1337 studies. In the second screening phase, all the papers selected in the previous phase were thoroughly read to confirm their eligibility based on the inclusion criteria. Again, the

same two reviewers screened 10 % of the studies, and after achieving agreement, each reviewer screened 50 % of the remaining studies. Through this process, 189 studies suitable for inclusion in the systematic review were identified (see Figure 6.1).

Figure 6.1

Flowchart of the article selection process (PRISMA flow diagram)
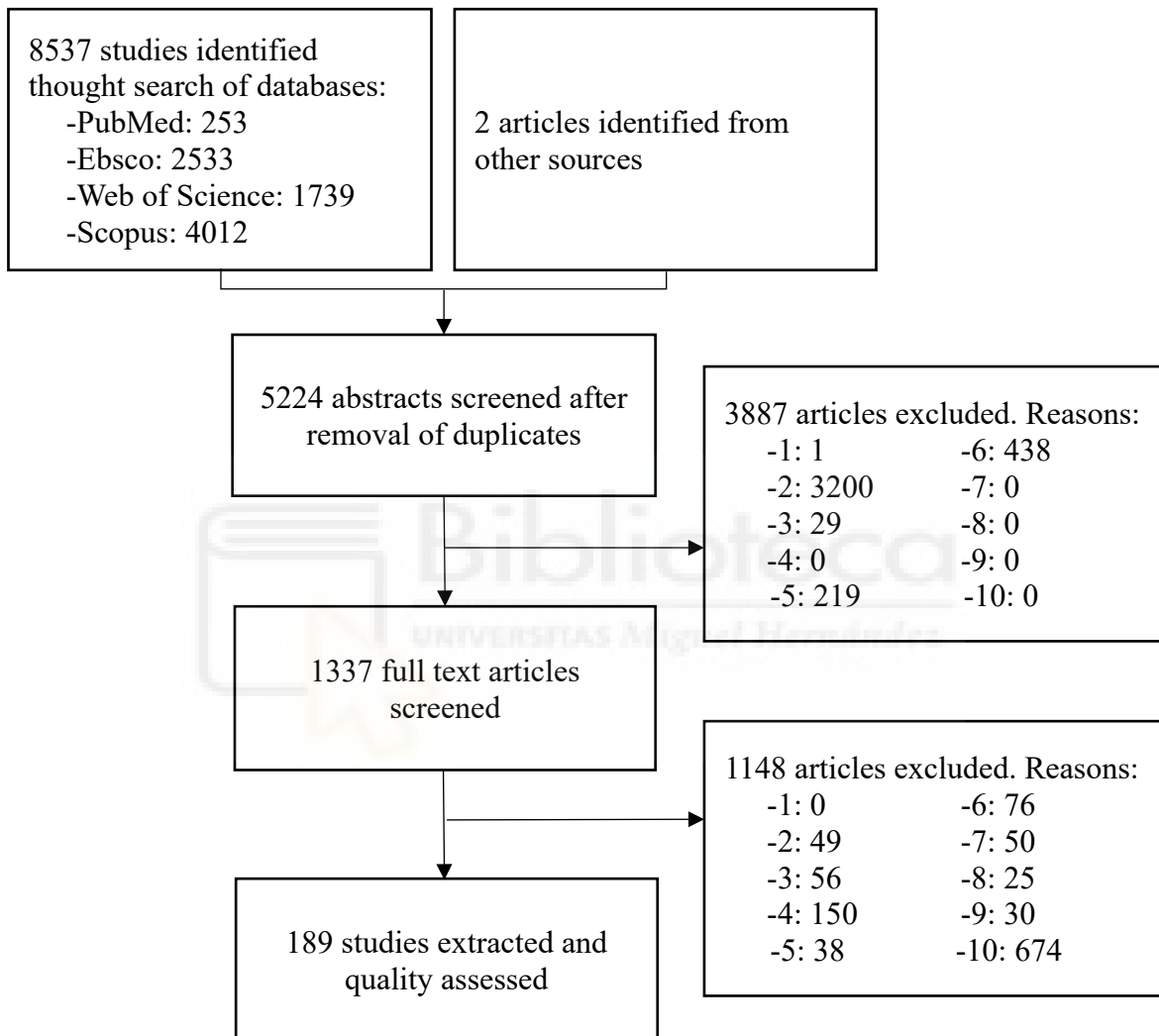
```
┌─────────────────────────────┐   ┌─────────────────────────────┐
│ 8537 studies identified     │   │                             │
│ thought search of databases:│   │ 2 articles identified from  │
│   -PubMed: 253              │   │ other sources               │
│   -Ebsco: 2533             │   │                             │
│   -Web of Science: 1739     │   │                             │
│   -Scopus: 4012             │   │                             │
└─────────────────────────────┘   └─────────────────────────────┘
                    │
                    ▼
        ┌───────────────────────────┐   ┌─────────────────────────────┐
        │ 5224 abstracts screened   │   │ 3887 articles excluded. Reasons: │
        │ after removal of duplicates│──▶│   -1: 1          -6: 438     │
        │                           │   │   -2: 3200       -7: 0       │
        └───────────────────────────┘   │   -3: 29         -8: 0       │
                    │                     │   -4: 0          -9: 0       │
                    ▼                     │   -5: 219        -10: 0      │
        ┌───────────────────────────┐   └─────────────────────────────┘
        │ 1337 full text articles   │
        │ screened                  │   ┌─────────────────────────────┐
        └───────────────────────────┘   │ 1148 articles excluded. Reasons: │
                    │                 ──▶│   -1: 0          -6: 76      │
                    ▼                     │   -2: 49         -7: 50      │
        ┌───────────────────────────┐   │   -3: 56         -8: 25      │
        │ 189 studies extracted and │   │   -4: 150        -9: 30      │
        │ quality assessed          │   │   -5: 38         -10: 674    │
        └───────────────────────────┘   └─────────────────────────────┘
```

Note. Exclusion criteria: 1 = Duplicate; 2 = Unrelated to the topic; 3 = Different language; 4 = Complete document not accessible; 5 = Not primary investigation; 6 = Do not measure at least three of the four traits; 7 = Divides all or some of the factors into subfactors without giving a total measure; 8 = Does not divide the Dark Triad or the Dark Tetrad; 9 = No questionnaire is administered to assess the Dark Triad or Dark Tetrad; 10 = Does not use an objective measure to assess trait-related characteristics of the Dark Triad or Dark Tetrad.

Subsequently, the variables of interest were coded in an Excel spreadsheet, following a coding manual that was prepared in advance. The Coding Manual provided detailed explanations for each variable to ensure clarity and consistency in data extraction. The coded variables included authors and publication year, information on the indirect instruments used (e.g., name, type, variables measured, and reliability indices), reported outcomes (i.e., statistical values indicating the relationship between the variables measured with the objective instruments and the traits of the Dark Triad or Dark Tetrad), and conclusions drawn from the studies regarding the relationship between the target variables and the traits.

During the coding process, several considerations were taken into account. Firstly, papers retrieved in April 2021 but published in 2022 were included in the review as they contained updated data. Secondly, the direction of the reported relationship (positive or negative) was not recorded, as it was not within the scope of the review. Only the value of the relationship was recorded. Lastly, in cases where studies presented results from different samples (e.g., among participants of different nationalities, or between genders), the results were combined rather than split by sample, as it was not the objective of the review. Interested readers are encouraged to consult the individual studies for sample-specific findings.

To classify the type of objective instrument, researchers followed the classification by Ortner and Proyer (2019) and added two additional categories mentioned in the introduction of this doctoral thesis (i.e., biomedical data or psychophysiological measures, and observer-reports). An "other" category was also included to accommodate instruments that indirectly assessed the dark traits but did not fit into any of the other categories. Each instrument was assigned to one of six categories: 1 = OPTs masked as achievement tasks, 2 = OPTs representing real-life simulations, 3 = Questionnaire-type OPTs for evaluations or decisions, 4 = Objective measure in observer-report format, 5 = Objective measure in biomedical data format, 6 = Other. For instruments classified as "other," additional details on how the variables were objectively evaluated were provided in parentheses.

One reviewer coded all the variables of interest for the 189 studies that met the inclusion criteria. Trained undergraduate students also participated as reviewers. To ensure coding reliability, three independent reviewers coded the variables for 19 studies (10 % of the studies). The results obtained by the three reviewers showed consistent findings for the author and year variables, measured variables and reliability indices, outcomes, and

conclusions. However, some discrepancies emerged when categorizing the objective instruments. To establish inter-rater reliability, a correlational analysis was conducted, indicating strong agreement among the three reviewers ($r = .90$, $p < .001$ between reviewer one and two; $r = .91$, $p < .001$ between reviewer one and three; $r = .99$, $p < .001$ between reviewer two and three). In cases where there was disagreement, an independent examiner provided their expert opinion to reach a consensus on the final category assignment for the instruments.

To ensure the replicability of the study, following open science guidelines, the coding manual are openly available in the OSF repository at https://osf.io/ptsn7/?view_only=002a406948f04331a29ead9b03191e02.

Quality assessment

The methodological rigor of the included studies was evaluated using the STROBE statement (Strengthening the Reporting of Observational Studies in Epidemiology; Elm et al., 2007; Vandenbroucke et al., 2007), which provides guidelines for the observational studies. This statement consists of a 22-item checklist (34, including sub-elements) that covers various sections of a study, including the title, abstract, introduction, methods, results, and discussion.

As all the studies analysed in this review were cross-sectional, the specific checklist for cross-sectional studies was used as a reference. This checklist contains a total of 32 items, with each item scored as 0 if the recommendation was not included, 0.50 if the recommendation was included but in an unspecific or incomplete manner, and 1 if the recommendation was fully addressed. Based on these scores, a quality index was calculated for each study. Scores equal to or greater than 85 indicated excellent quality, scores between 70 and 85 indicated good quality, scores between 50 and 70 indicated fair quality, and scores below 50 indicated poor quality (Limaye et al., 2018). The notation "NA" was used when a recommendation was not applicable to a particular study and therefore not evaluated.

To calculate the quality index, the item scores for each study were summed, multiplied by 100, and divided by the maximum quality score (32, unless some items were marked as "NA"). One reviewer assessed all 32 items for the 189 studies that met the inclusion criteria, and another reviewer independently assessed 10 % of those studies (19

out of 189). Inter-observer reliability was assessed using correlational analysis, which revealed strong agreement between the two raters ($r = .81$, $p < .001$).

Study 7, objective 7. Observer-reports as a complement to self-reports in the assessment of Dark Triad: a meta-analysis

Version 1 and Version 2

Search strategy and study selection

The search strategy was the same in both versions. In April 2021, a systematic search was conducted in four databases: PubMed, Web of Science, Scopus, and PsycINFO. The search aimed to identify relevant literature using specific terms related to the Dark Triad, Dark Tetrad, Dark traits, Narcissism, Machiavellianism, and Psychopathy, so the search string was constructed as follows: ("Dark Triad" OR "Dark Tetrad" OR "Dark traits") OR ("Narcissism" AND "Machiavellianism" AND "Psychopathy"). The starting year for the search was set as 2002, which marks the introduction of the Dark Triad traits (Paulhus & Williams, 2002).

Inclusion and exclusion criteria

In the first version of this meta-analysis, only observer-reports used to assess Dark Triad or Dark Tetrad traits as initially conceived by Paulhus and Williams (2002) were of interest. Consequently, studies that subdivided the traits into subfactors (e.g., Machiavellianism into interpersonal tactics, cynical view of human nature, and disregard for conventional morality), studies that reported only a combined total score for the Dark Triad or Dark Tetrad without providing individual trait scores, or studies not assessed at least the three traits of the Dark Triad were excluded from our analysis.

Nevertheless, an exception was made to the exclusion criteria for studies that divided trait narcissism into vulnerability and grandiosity subfactors because the grandiosity subfactor aligns with narcissism within the Dark Triad (Jones & Paulhus, 2014). Consequently, omitting studies that made this division and failing to consider the grandiosity aspect would be an oversight. Hence, in contrast to the other dark traits, if a study incorporated such a subdivision, grandiose narcissism was considered relevant for inclusion in this meta-analysis.

To establish the eligibility of studies, specific inclusion criteria were defined as follows: (1) Non-duplicated studies; (2) Studies written in Spanish or English; (3) Studies focusing on the traits of interest (the Dark Triad or the Dark Tetrad); (4) Acceptance of any

type of paper, provided it is complete; (5) Exclusively primary research, including only original studies and excluding narrative, systematic, meta-analytic reviews, or umbrella reviews; (6) Studies measuring at least three of the four traits (narcissism, Machiavellianism, and psychopathy) that constitute the Dark Triad; (7) Studies that divided the Dark Triad and Dark Tetrad into their individual traits, without solely presenting a single combined dark score (e.g., only a total Dark Tetrad score); (8) Studies that did not subdivide all or some of the traits into subfactors (e.g., providing the Machiavellianism trait but not its subfactors, such as interpersonal tactics, cynical view of human nature, and disregard for conventional morality); (9) Studies that utilized self-report questionnaires to assess the Dark Triad or Dark Tetrad traits; (10) Studies that employed observer-reports to assess the Dark Triad or Dark Tetrad traits.

For the second version of the meta-analysis, the same inclusion and exclusion criteria from the first version were utilized, except that criterion 6, which specified that studies must assess at least the three traits of the Dark Triad. This was not considered.

Screening phases and data extraction

To streamline the process of identifying and removing duplicates, all the studies retrieved from the databases (PubMed, Scopus, Web of Science, and PsycINFO) because of the search were downloaded and managed using the Zotero reference manager (https://www.zotero.org/).

In the first version, following the elimination of duplicates ($n = 3315$), the remaining studies were transferred to an Excel spreadsheet to facilitate the subsequent stages of the selection process, specifically the phases involving the application of the inclusion criteria for the meta-analysis. In the initial stage, the titles and abstracts of each study were reviewed from the Excel sheet, and those that did not fulfil the inclusion criteria were excluded. In the case of studies about which the reviewers had doubts, they were not immediately excluded and were considered for further evaluation in the subsequent phase. In the second stage, each study that was not excluded during the initial screening underwent a thorough examination to determine its definitive inclusion based on the pre-established inclusion criteria. After completing both screening phases, a total of seven manuscripts were identified for inclusion in the meta-analysis (Figure 7.1).

During both phases of the study selection process, two independent reviewers

Figure 7.1

Flowchart of the data collection (PRISMA flow diagram)
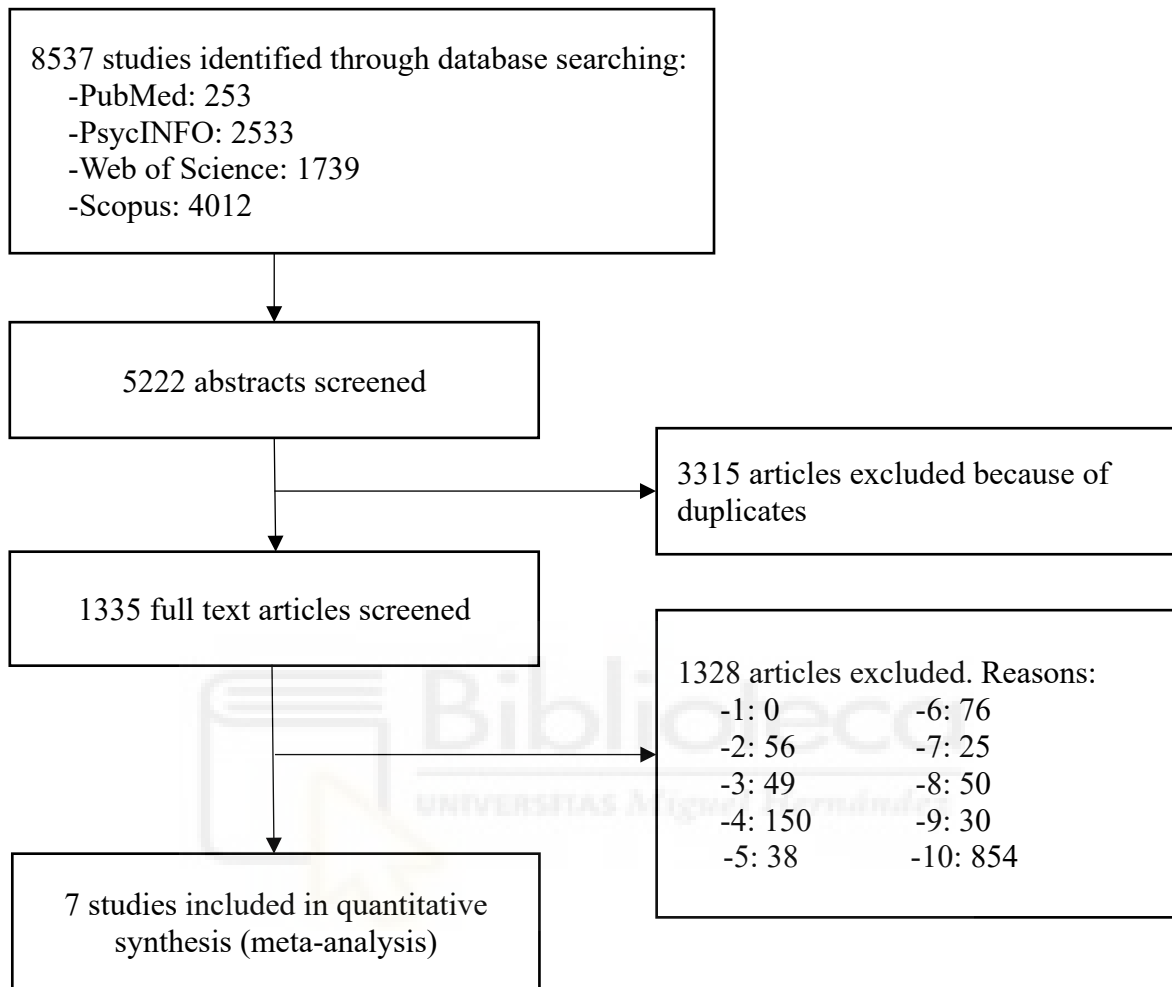
```
┌─────────────────────────────────────────────────┐
│ 8537 studies identified through database          │
│ searching:                                        │
│    -PubMed: 253                                   │
│    -PsycINFO: 2533                                │
│    -Web of Science: 1739                          │
│    -Scopus: 4012                                  │
└─────────────────────────────────────────────────┘
                      │
                      ▼
┌───────────────────────────────────┐
│ 5222 abstracts screened           │
└───────────────────────────────────┘
                      │              ┌───────────────────────────────────────┐
                      ├─────────────▶│ 3315 articles excluded because of      │
                      │              │ duplicates                             │
                      ▼              └───────────────────────────────────────┘
┌───────────────────────────────────┐
│ 1335 full text articles screened  │
└───────────────────────────────────┘
                      │              ┌───────────────────────────────────────┐
                      │              │ 1328 articles excluded. Reasons:       │
                      ├─────────────▶│    -1: 0          -6: 76               │
                      │              │    -2: 56         -7: 25               │
                      │              │    -3: 49         -8: 50               │
                      │              │    -4: 150        -9: 30               │
                      ▼              │    -5: 38         -10: 854             │
┌───────────────────────────────────┐└───────────────────────────────────────┘
│ 7 studies included in quantitative │
│ synthesis (meta-analysis)          │
└───────────────────────────────────┘
```

Note. Exclusion criteria: 1 = Duplicate; 2 = Language different from English or Spanish; 3 = Unrelated to the Dark Triad or Dark Tetrad; 4 = Full document not available; 5 = Not primary investigation; 6 = Do not measure at least three of the four traits; 7 = Reports a total Dark Triad or Dark Tetrad score, without dividing it into its traits; 8 = Divides all or some of the traits into subfactors without giving a total measure of each trait; 9 = No questionnaire is administered to assess the Dark Triad or Dark Tetrad traits; 10 = Does not use an observer-report to assess the Dark Triad or Dark Tetrad traits.

initially assessed the same set of studies (10 % of all studies) to establish and ensure inter-reviewer agreement. Subsequently, each reviewer examined half of the remaining articles (i.e., 50 %) with the assistance of trained undergraduate students.
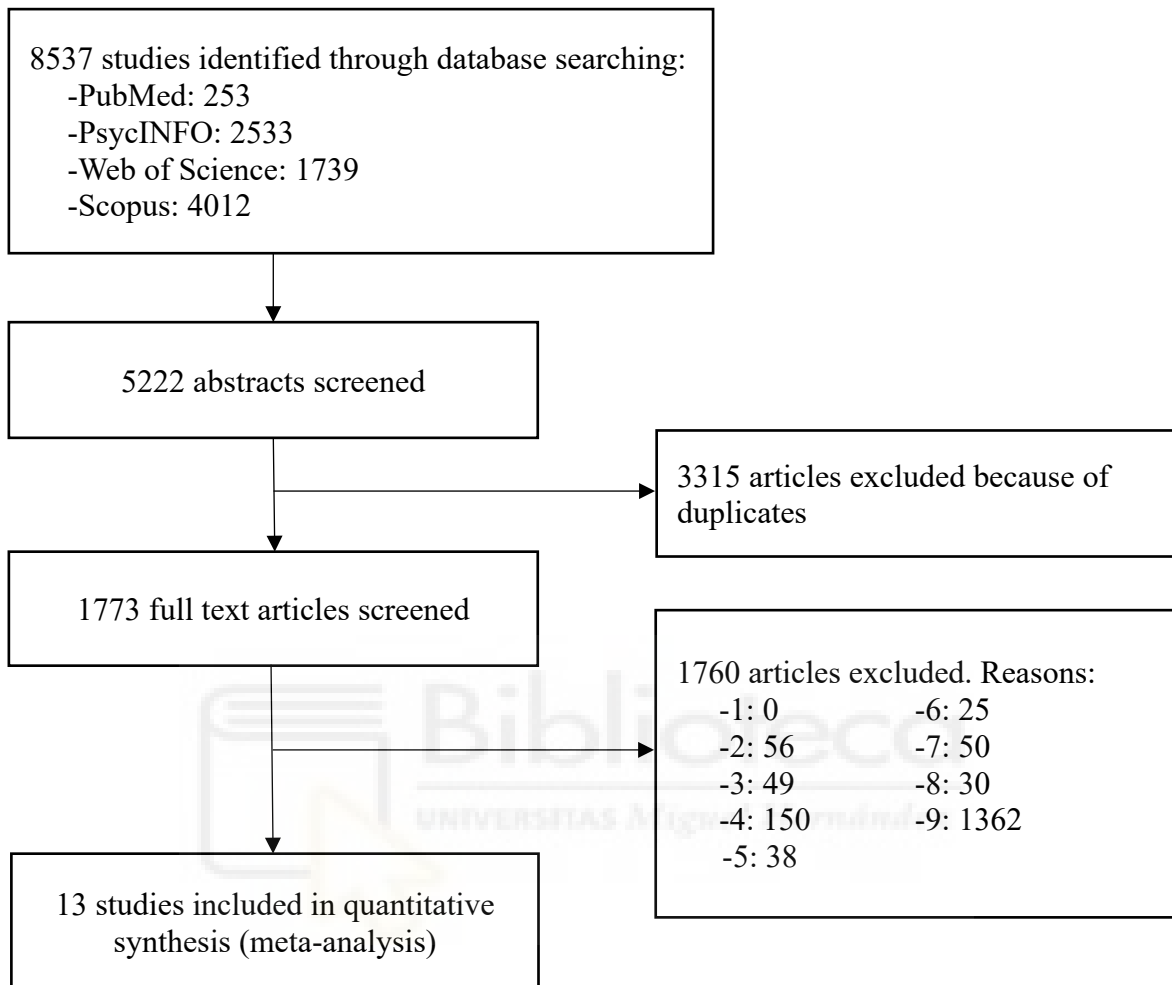
After identifying the studies that met the inclusion criteria for the meta-analysis, the relevant data were extracted (variable coding phase) and recorded in an Excel spreadsheet. To minimize coding discrepancies and potential inconsistencies between reviewers, a comprehensive coding manual was developed, providing detailed instructions for coding each variable. The extracted data from each study included the following information: (1) Authors and year of publication of the study; (2) Characteristics of the study sample, i.e., sample size, mean age and standard deviation, gender proportion, and type of sample; (3) Details about the questionnaires employed in the study: the self-report used to assess the Dark Triad or Dark Tetrad traits, its reliability index (i.e., α), the observer-report used for assessing the Dark Triad or Dark Tetrad traits, its reliability index (α), and the identity of the informant (i.e., the persons completing the observer-report); (4) The obtained results: correlation values between the Dark Triad or Dark Tetrad traits measured using the self-report and the observer-report.

In this final phase of data extraction, two reviewers independently coded the variables of one of the seven manuscripts. To assess the inter-rater reliability, a correlational analysis was conducted, revealing a high level of agreement between the two raters, with a correlation coefficient of $r = 1$, $p < .001$. Subsequently, one of the previous reviewers coded the variables of the remaining six studies. In case of any uncertainties regarding a variable in any study, the other reviewers of this meta-analysis were consulted to reach a consensus. If any relevant data were missing from a study, the primary reviewer reached out to the corresponding author to request the necessary information. The entire process is presented in Figure 7.1, which depicts the PRISMA flow (Moher et al., 2010), illustrating each step involved in the data extraction and review process.

The screening and data extraction procedures for the second version followed the same methodology as in the first version. However, in this updated version, the two screening phases were repeated to re-evaluate all previously excluded studies based on exclusion reason 6 from the first version. Studies that raised doubts among the reviewers were not immediately discarded and were further considered in the subsequent phase. During the first screening, studies that were not excluded were meticulously examined in the second screening to determine whether they met the inclusion criteria. As a result, a total of 13 studies were included in this second version, which is six more than in the first version, resulting in nine additional effect sizes (as depicted in Figure 7.2).

Figure 7.2

Flowchart of the data collection (PRISMA flow diagram)

```
┌─────────────────────────────────────────────┐
│ 8537 studies identified through database      │
│ searching:                                    │
│    -PubMed: 253                               │
│    -PsycINFO: 2533                            │
│    -Web of Science: 1739                      │
│    -Scopus: 4012                              │
└─────────────────────────────────────────────┘
                    │
                    ▼
┌─────────────────────────────────────────────┐
│ 5222 abstracts screened                       │──────►┌──────────────────────────────────┐
└─────────────────────────────────────────────┘       │ 3315 articles excluded because of  │
                    │                                   │ duplicates                         │
                    ▼                                   └──────────────────────────────────┘
┌─────────────────────────────────────────────┐
│ 1773 full text articles screened              │──────►┌──────────────────────────────────┐
└─────────────────────────────────────────────┘       │ 1760 articles excluded. Reasons:   │
                    │                                   │    -1: 0          -6: 25           │
                    ▼                                   │    -2: 56         -7: 50           │
┌─────────────────────────────────────────────┐       │    -3: 49         -8: 30           │
│ 13 studies included in quantitative           │       │    -4: 150        -9: 1362         │
│ synthesis (meta-analysis)                     │       │    -5: 38                          │
└─────────────────────────────────────────────┘       └──────────────────────────────────┘
```

Note. Exclusion criteria: 1 = Duplicate; 2 = Language different from English or Spanish; 3 = Unrelated to the Dark Triad or Dark Tetrad; 4 = Full document not available; 5 = Not primary investigation; 6 = Reports a total Dark Triad or Dark Tetrad score, without dividing it into its traits; 7 = Divides all or some of the traits into subfactors without giving a total measure of each trait; 8 = No questionnaire is administered to assess the Dark Triad or Dark Tetrad traits; 9 = Does not use an observer-report to assess the Dark Triad or Dark Tetrad traits.

Quality assessment

The assessment of the methodological quality of the studies was the same in both versions. It was evaluated using the STROBE list (Strengthening the Reporting of

Observational Studies in Epidemiology; Elm et al., 2007; Vandenbroucke et al., 2007), which comprises 34 checklist criteria outlining the essential content that should be present in a published study. As this meta-analysis focused on cross-sectional studies, the list was adapted to consist of a total of 32 criteria to be scored. A score of 1 indicated full adherence to the guideline, a score of 0.50 represented partial inclusion (incomplete or not very specific), and a score of 0 indicated the criterion's absence from the study.

These points made it possible to obtain a total quality score for the included studies. Each study was categorized into one of four levels based on its quality: excellent (score equal to or greater than 85), good (score between 70 and 85), fair (score between 50 and 70), or poor (score less than 50). The scores were derived by summing up the scores assigned to each item, multiplying by 100, and dividing by the maximum possible score, accounting for cases where "NA" was assigned when an item did not apply to the study.

To ensure the reliability of the quality assessment, two independent reviewers evaluated one of the seven studies included in the Version 1, while a single reviewer assessed the remaining studies in both versions. Inter-rater reliability was determined through a correlational analysis, showing good agreement with a correlation coefficient of $r = .75$, $p < .001$.

Statistical analysis

In the first version, the strength of the relationships between the Dark Tetrad traits, as measured by self-report and observer-report, was estimated through the calculation of effect sizes based on Pearson's correlations (r) reported in the selected studies for the meta-analysis. To gauge the significance of these correlations, Cohen's (1992) criteria were employed as a reference: correlations around $r = .10$ were considered to have a small magnitude, correlations around $r = .30$ were regarded as having a medium magnitude, and correlations at or above $r = .50$ were seen as having a large magnitude.

In one of the studies (Lämmle et al., 2021), three correlations between self-report and observer-report for each trait were reported. To ensure data integrity and avoid duplicating the sample, these correlation values were transformed into Fisher's Z scores, then averaged to obtain a single value, and finally transformed back into correlation coefficients (r values), following the approach suggested by Sánchez-Bruno and Borges del Rosal (2005).

The analysis used Fisher's *z*-transformed correlation coefficient as the outcome measure, and a random effects model was employed for data analysis. To estimate the amount of heterogeneity in the data (i.e., τ^2), the Restricted Maximum Likelihood Estimator (REML; Viechtbauer, 2010) was utilized. Additionally, heterogeneity was assessed using the Q-test (Cochran, 1954), and the Higgins test (I^2) was calculated along with 95 % prediction intervals to determine the observed results.

Finally, an investigation into potential publication biases was conducted using the Begg and Mazumdar rank correlation test (1994). This test calculates a correlation coefficient between the effect size and its variance in a funnel plot, and the presence of publication bias is indicated by a significant correlation (*p*-value < .05). However, it is worth noting that this test may lack sufficient power to detect bias when the number of studies is limited. To enhance sensitivity in identifying bias, the Egger's regression test (1997) was also applied. This test examines the relationship between the effect size and its precision (standard error) in a funnel plot as well by performing a linear regression analysis. Similarly, the presence of publication bias is indicated by a significant intercept (*p*-value < .05). All statistical analyses were carried out using the Jamovi (version 2.2.5) statistical program.

In the second version, the statistical analysis was the same as in the first version. However, there was an additional component to the analysis, which involved incorporating moderating variables to explore their potential influence on the relationship between traits assessed via self-report and observer-report. Specifically, the type of informant was included as a moderator, and it was recoded into two categories: 0, representing cases where the informant was someone familiar, such as family, friends, or romantic partners, and 1, indicating cases where the informant was someone unfamiliar or unknown.

The analysis scripts used for this research can be accessed at https://osf.io/vdsgx/?view_only=422bab65dd3148ea8f0faef4cb7d97a2.

RESULTS

Study 1, objective 1. Are the dark personalities sincere? Connections between the Dark Triad and the Big Three

Relations between the Dark Triad traits, the Eysenck's major traits, and the scores of the sincerity variable of the EPQR-A scale

Regarding the relations between the three of Eysenck's major traits and the Dark Triad, positive correlations between neuroticism and narcissism and Machiavellianism were obtained. Furthermore, relations between psychoticism and all three Dark Triad traits were reported, with psychopathy showing the strongest association and narcissism displaying the weakest connection. Extraversion exhibited small but significant negative correlations with psychopathy and positive correlations with narcissism. Additionally, robust and significant relationships between the three Dark Triad traits and the sincerity variable of the EPQR-A were obtained ($p < .01$ in all cases; Table 1.1).

Table 1.1

Means (standard deviations) and correlations between the Dark Triad, the PEN model of personality, sincerity and sociodemographic variables

	Mean (SD) N = 2385	1	2	3	4	5	6	7	8	9
1. Neuroticism	2.99 (1.96)	1								
2. Extraversion	3.85 (2.10)	-.18**	1							
3. Psychoticism	1.78 (1.27)	.10**	-.01	1						
4. Sincerity	3.27 (1.61)	.11**	-.04*	.16**	1					
5. Machiavellianism	4.50 (3.34)	.15**	.04	.20**	.47**	1				
6. Narcissism	6.35 (3.82)	.16**	.11**	.08**	.28**	.48**	1			
7. Psychopathy	3.06 (2.82)	.00	-.06**	.25**	.22**	.43**	.26**	1		
8. Sex	—	-.15**	-.07**	.17**	.10**	.14**	.11**	.22**	1	
9. Age	—	-.20**	.04	-.16**	-.23**	-.16**	-.10**	-.08**	.00	1

*Note.* *$p < .05$, **$p < .01$. Gender was code as 1 = Female / 2 = Male.

To ensure that the observed relationships were consistent with the hypotheses and not influenced by measurement error or other factors, a SEM analysis following the correlational analyses was conducted. As a result, the SEM (Figure 1.1) demonstrated a good fit to the data ($\chi^2 = 1102.743$, DF = 573, RMSEA = .020, SRMR = .051, CFI = .979, GFI = .984, NFI = .958). Including the structural paths in the SEM, the sincerity scale from the EPQR-A emerged as a significant predictor of scores in the Dark Triad, with $\beta = .40$ for narcissism, $\beta = .36$ for psychopathy, and the highest association with Machiavellianism ($\beta = .70$). Notably, path model revealed additional noteworthy connections. Specifically, narcissism and Machiavellianism were predicted by both neuroticism and extraversion, with

β coefficients of .20 and .19 for narcissism respectively and β coefficients of .12 and .10 for Machiavellianism respectively. Psychopathy showed a positive relationship with scores in psychoticism (β = .29) but a negative association with extraversion (β = -.09).

The EPQR-A accounted for a considerable proportion of variance in the Dark Triad scales, with R^2 values of .23 for narcissism, .58 for Machiavellianism, and .28 for psychopathy. On average, the EPQR-A explained approximately 36 % of the variance across the Dark Triad scales.

Figure 1.1

Structural Equation Modelling of the EPQR-A predicting the Dark Triad
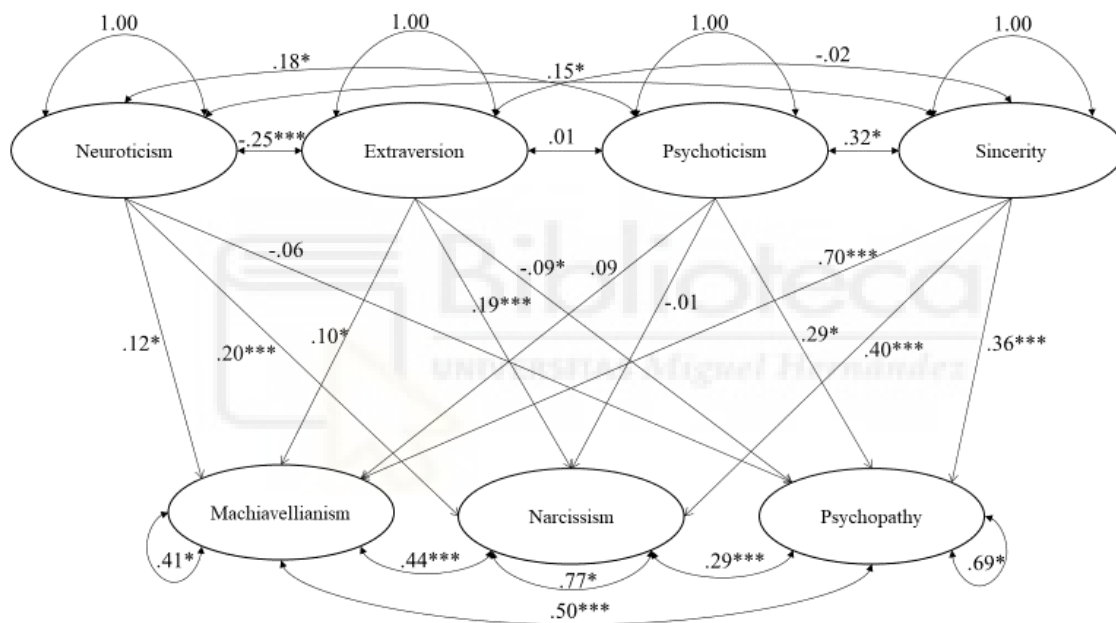
Note. * = p < .05, ***p < .001.

Study 2, objective 2. Civic engagement and personality: Associations with the Big Five and the Dark Triad

Descriptive statistics of the instruments and correlations between the variables

Participants scored moderately high on the civic engagement variable ($M = 31.68$; $SD = 5.43$; range 7-42). Of the three Dark Triad traits, they scored highest on Machiavellianism ($M = 16.77$; $SD = 6.60$; range 0-36) and narcissism ($M = 15.11$; $SD = 5.28$; range 0-36), and of the Big Five traits, they had similar scores on all traits (around a mean of 7.50; range 2-12).

As for bivariate correlations (with the Bonferroni fit, i.e., $p < 0.0056$), there was a significant correlation between civic engagement and two traits of the Dark Triad: narcissism and Machiavellianism. However, the correlation with narcissism was positive, while the correlation with Machiavellianism was negative. Furthermore, civic engagement showed a significant positive relationship with four of the Big Five personality traits: extraversion, agreeableness, conscientiousness, and openness to experience. Conversely, there was a negative and significant relationship with neuroticism. The relation between the Dark Triad traits and the Big Five personality traits exhibited greater variability. Narcissism showed a significant correlation with all five traits, but it was positively related with extraversion, conscientiousness, and openness to experience, while negatively related with agreeableness and neuroticism. On the other hand, Machiavellianism was solely negatively and significantly related to agreeableness. Lastly, psychopathy was only negatively related to agreeableness and conscientiousness (Table 2.1).

Table 2.1

Bivariate correlations among study variables

	Civic Engagement	Extraversion	Agreeableness	Conscientiousness	Openness to Experience	Neuroticism
Civic engagement		0.22*	0.14*	0.23*	0.28*	−0.09*
Narcissism	0.25*	0.40*	−0.09*	0.14*	0.15*	−0.15*
Machiavellianism	−0.11*	−0.05	−0.29*	−0.06	−0.05	−0.01
Psychopathy	−0.08	0.06	−0.22*	−0.09*	0.01	0.06

Note. *$p < 0.0056$ (Bonferroni fit).

Associations between civic engagement, Dark Triad traits, and the Big Five personality traits

The regression model is presented in Table 2.2. Regarding the socio-demographic variable (gender) in the first block, it exhibited a negligible contribution (0 %) to the explained variance of civic engagement. However, when the three Dark Triad traits were included in the model in the second block, a significant contribution of 11 % ($p < 0.001$) was observed. This contribution increased to 19 % ($p < 0.001$) when the Big Five traits were included as a third step in the model. Specifically, in the second block, all three Dark Triad traits showed significant associations with civic engagement ($p < 0.0056$, Bonferroni fit). However, when the Big Five traits were introduced, only narcissism remained significantly associated (positively) with civic engagement. Among the Big Five traits, only agreeableness, conscientiousness, and openness to experience demonstrated significant and positive associations ($p < 0.0056$, Bonferroni fit). In the fully adjusted model (third block), including all traits, it was observed that narcissism had the highest specific contribution ($sr^2 = 3.42$ %) among the Dark Triad traits, while openness to experience had the highest specific contribution ($sr^2 = 4.37$ %) among the Big Five traits.

Table 2.2

Associations between civic engagement, Dark Triad traits, and the Big Five personality traits

C	P	Block 1				Block 2				Block 3			
		β	t	$r_{x.y}$	sr^2	β	t	$r_{x.y}$	sr^2	β	t	$r_{x.y}$	sr^2
	Ge	.01	0.34	.01	0.01%	.02	0.80	.02	0.05%	.03	1.06	.03	0.08%
	N					.35	11.45*	.32	9.92%	.23	7.05*	.19	3.42%
	M					-.16	-4.78*	-.13	1.74%	-.09	-2.69	-0.07	0.49%
	P					-.11	-3.21*	-.09	0.77%	-.07	-2.14	-.06	0.31%
	E									.06	2.09	.06	0.30%
CE	A									.10	3.61*	.10	0.90%
	C									.15	5.38*	.14	1.99%
	O									.22	7.99*	.21	4.37%
	N									-.07	-2.42	-.06	0.40%
	R^2	.01				.11				.19			
	F	0.12				36.83*				32.48*			

Note. C = Criterion variable; P = Predictor variable; CE = Civic engagement; Ge = Gender; N = Narcissism; M = Machiavellianism; P = Psychopathy; E = Extraversion; A = Agreeableness; C = Conscientiousness; O = Openness to experience; NE = Neuroticism; *$p < 0.0056$ (Bonferroni fit).

Study 3, objective 3. The connection between Dark Triad and Emotional Intelligence traits: A multi-study person-centred approach

Descriptive statistics of Dark Triad and IE, internal consistency of all scales, and correlations between all study variables

The participants' highest score on the Dark Triad traits was on Machiavellianism ($M = 16.83$; $SD = 6.64$; range 0-36), and the lowest on psychopathy ($M = 9.25$; $SD = 5.60$; range 0-36). In relation to EI, the highest score was in the emotionality factor ($M = 40.31$; $SD = 6.94$; range 8-56). In terms of the reliability of the measurement instruments employed, all factors exhibited satisfactory levels of internal consistency (α), ranging from .71 to .91, except for narcissism, self-control, emotionality, sociability, and psychological strengths (between .58 and .66).

Bivariate correlations indicated significant negative relationships between EI factors (including the total score) and Machiavellianism and psychopathy, except for sociability, which showed a positive relationship with psychopathy ($p < .01$). On the other hand, positive relationships were observed between EI factors (including the total score) and narcissism, particularly with the sociability and well-being factor ($p < .01$ and p < .05).

In relation to the other variables of interest, both EI factors and narcissism showed positive correlations with those considered positive (i.e., self-esteem, emotional well-being, psychological well-being, social well-being and civic engagement); and negative correlations with those considered negative (i.e., difficulties and personal distress) ($p < .01$ and $p < .05$), except in the case of psychological strengths (prosocial behaviour), where narcissism shows a weak negative correlation ($p < .01$). Notably, all these relationships with psychopathy and Machiavellianism were in the opposite direction ($p < .01$ and $p < .05$).

Latent Profile Analysis

As a result of the LPA, the solutions of one to six profiles were obtained and, after analysing the best combination of the fit indices and the Elbow Graph, the 3-profile solution was considered the most optimal (Table 3.1 and Figure 3.1). It was also considered that the minimum percentage of representation of the subgroups should be greater than 5 %, since a lower percentage in any of the subgroups might not really represent a profile (Marsh et al., 2009; Morin et al., 2016). In the 5- and 6-profile models, one of the subgroups represented only 5 %, so they were not considered optimal.


Table 3.1

Model fit indices for 1- through 6-profile solutions

Profiles	AIC	BIC	SSA-BIC	Entropy	VLMR	Adjusted LRT
1	24673.635	24745.367	24700.896	—	—	—
2	23909.843	24022.564	23952.682	.660	.000	*p* < .001
3	23346.952	23500.663	23405.369	.731	.001	*p* = .001
4	23062.159	23256.859	23136.154	.763	.063	*p* > .05
5	22898.254	23133.943	22987.826	.762	.002	*p* < .01
6	22783.428	23060.106	22888.578	.761	.005	*p* < .01

Note. AIC = Akaike Information Criterion; BIC = Bayesian Information Criteria; SSA-BIC = BIC adjusted for sample size; VLRM = Vuong-Lo-Mendel-Rubin; LRT = Likelihood Ratio Test.

Figure 3.1

*Elbow Graph for the solutions from 1 to 6 profiles*
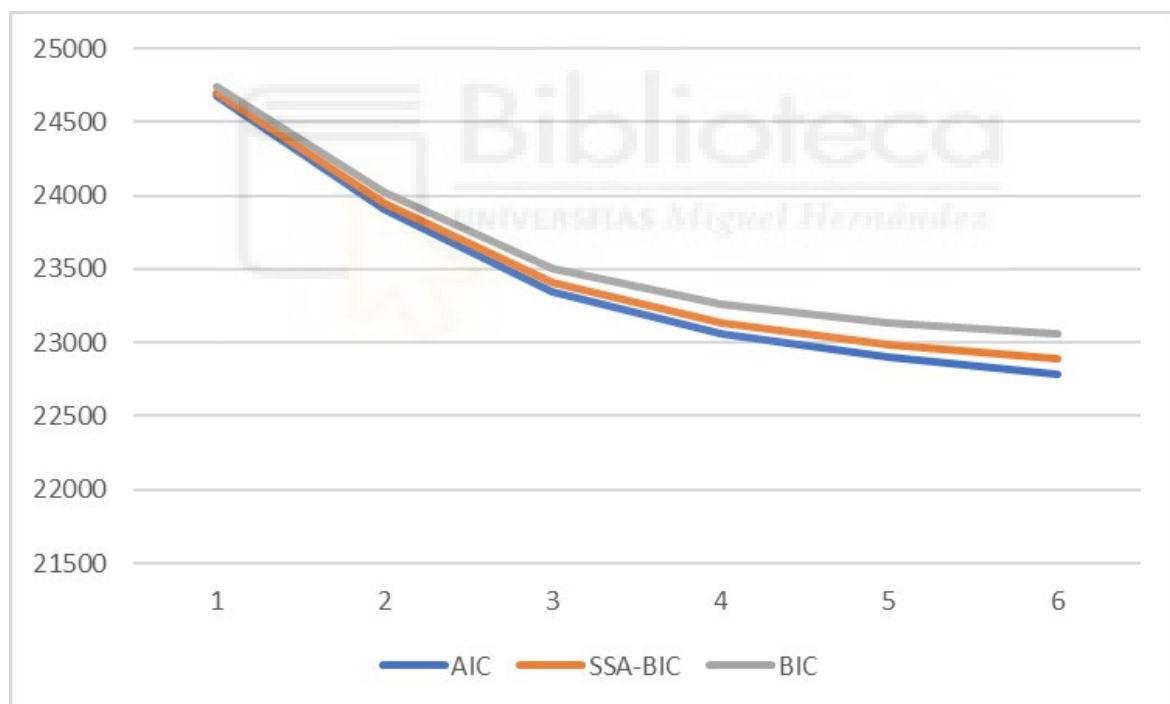
Note. AIC = Akaike Information Criterion; BIC = Bayesian Information Criteria; SSA-BIC = BIC adjusted for sample size.

The 3-profile model yielded the following distribution: (1) Profile 1 represented by participants characterised by low scores on the Dark Triad traits (especially on narcissism) and on the EI factors (especially on well-being and sociability); (2) Profile 2 represented by participants with low scores on Machiavellianism and psychopathy, but medium-high scores

on narcissism and high EI; and (3) Profile 3 represented by participants with high scores on the Dark Triad traits and medium-low scores on EI (especially on emotionality). The latter profile had the highest scores on dark traits, while the second profile had the highest scores on EI (Figure 3.2).

Figure 3.2

Profiles of Dark Triad traits and Emotional Intelligence
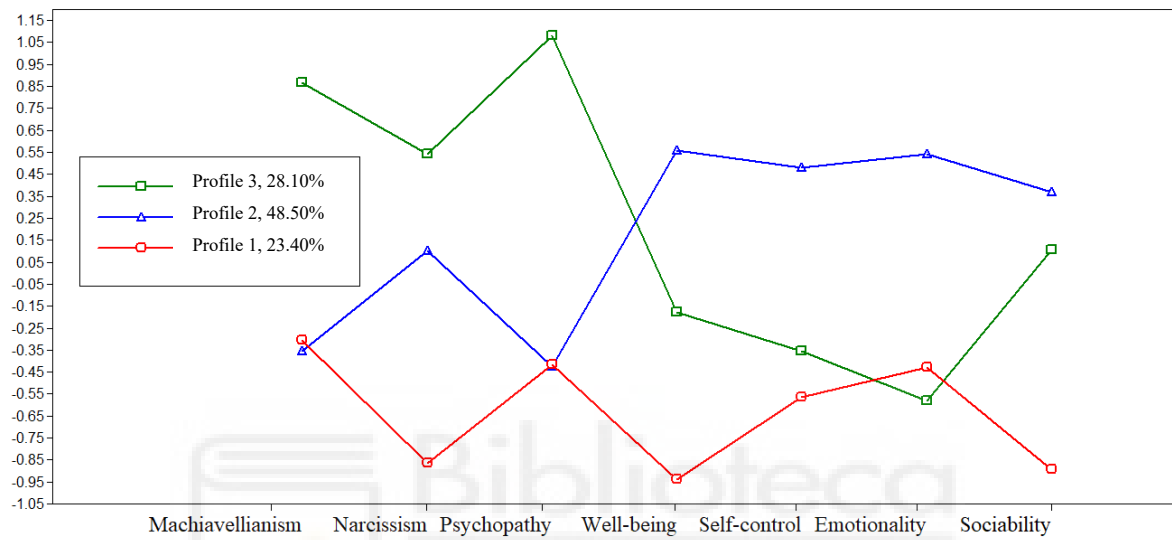
Differences between profiles

In the MANOVA analysis, significant differences were observed among the three profiles across various variables of interest ($p < .001$; Wilk's $\lambda = .001$; partial $\eta^2 = .31$) (Table 3.2 and Figure 3.3). Specifically, *post hoc* comparisons revealed significant differences between the profiles on all variables, except for the difficulty variable between Profile 1 and Profile 3.

It can be observed that among the three profiles, Profile 2 exhibits the highest levels of self-esteem, personal strengths, well-being (including emotional, psychological, and social well-being), and commitment to the community. Moreover, it demonstrates the lowest levels of psychological difficulties and personal distress. Conversely, Profile 1 appears to experience the most difficulties, personal distress, and the worst levels of self-esteem, well-being, and civic engagement. Finally, Profile 3 exhibits fewer psychological strengths compared to the other profiles.

Table 3.2

Differences of the four profiles in the other variables of interest

Variables	M (SD)			$F_{(2, 1241)}$	η_p^2
	Profile 1 (*n* = 283)	Profile 2 (*n* = 603)	Profile 3 (*n* = 355)		
Self-esteem	-0.92 (0.88)	0.49 (0.75)	-0.10 (0.91)	266.93***	.31
Strengths	-0.03 (0.98)	0.26 (0.79)	-0.46 (1.77)	59.15***	.09
Difficulties	0.54 (0.94)	-0.52 (0.77)	0.45 (0.97)	195.74***	.25
Personal distress	0.65 (0.94)	-0.46 (0.82)	0.23 (0.94)	163.50***	.22
Emotional well-being	-0.70 (0.98)	0.40 (0.81)	-0.13 (0.97)	139.82***	.19
Psychological well-being	-0.76 (1.01)	0.46 (0.75)	-0.15 (0.93)	187.21***	.24
Social well-being	-0.60 (1.02)	0.33 (0.86)	-0.10 (0.97)	92.71***	.14
Civic engagement	-0.50 (1.02)	0.30 (0.88)	-0.10 (0.98)	68.81***	.11

Note. ***p < .001.

Figure 3.3

Standardised mean scores (z-score, M = 0) of different profiles on the variables of interest
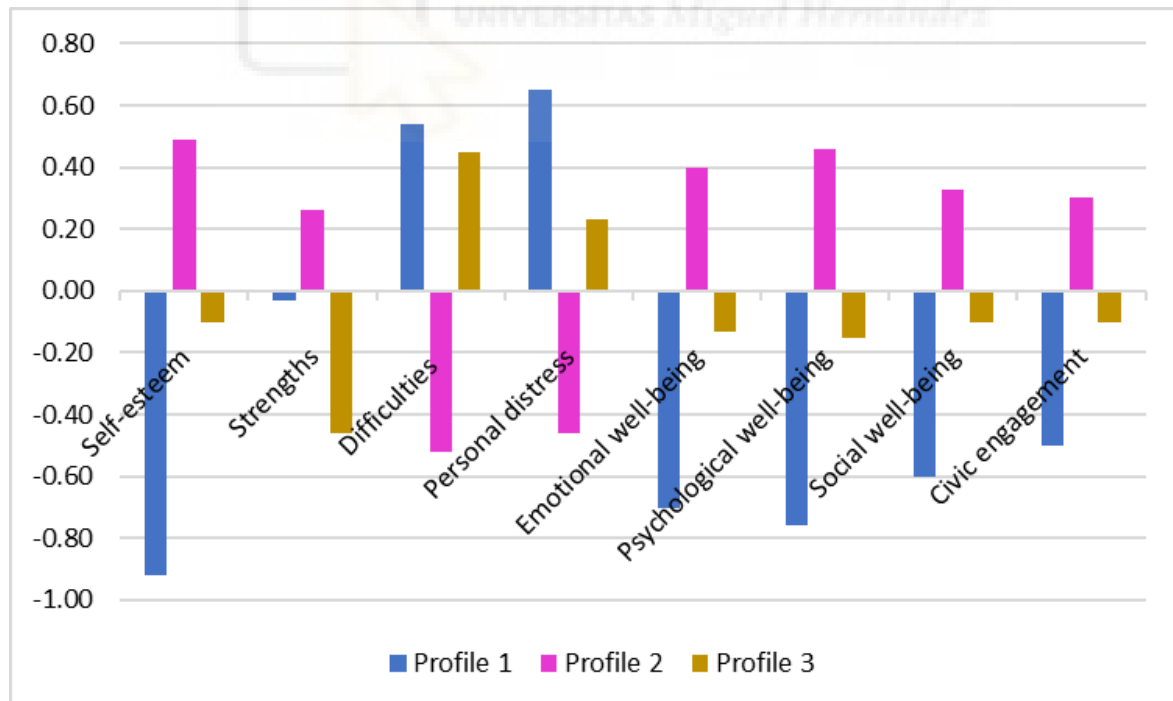
Study 4, objective 4. Unveiling the depths of Tinder: Decoding the Dark Tetrad and sociosexuality in motives behind online dating

Confirmatory Factor Analysis (CFA) of the Tinder Motives Scale-Short Form (39-items TMS-SF)

In the first study, the CFA generated factor loadings for the 58 items in the Spanish version that make up the 13 factors. To adhere to the principle of parsimony, which seeks simplicity (Vandekerckhove et al., 2015), we excluded items with the lowest loadings. Consequently, we retained only three items per factor, totaling 39 items.

The CFA results for the 58-items TMS, including the 13 factors, yielded the following fit indices: $\chi2$ = 3680.536, DF = 1517, p < .001, NFI = .742, GFI = .646, CFI = .829, SRMR = .086, RMSEA = .079. For the 39-item TMS and the same number of factors (i.e., 13) the fit indices were as follows: $\chi2$ = 1211.576, DF = 624, p < .001, NFI = .864, GFI = .803, CFI = .928, SRMR = .062, RMSEA = .064. These findings suggest that the 58-item model does not align well with the data, as the fit indices fall outside acceptable ranges, signifying a notable disparity between the model and the dataset. Conversely, the 39-item model demonstrates a good fit, as indicated by the fit indices. As a result, we obtained the new scale: the Tinder Motives Scale-Short Form (TMS-SF).

Descriptive statistics and reliability coefficients for the 39-items TMS-SF

Table 4.1 presents the descriptive statistics and reliability coefficients of the abbreviated version of the scale, i.e., the 39-item TMS-SF. The data reveals that the highest scores were observed for the variables related to socialization, entertainment, and curiosity, suggesting that these are the primary motivations for using or having used Tinder within the sample. On the other hand, the motivation related to "belongingness" appeared to be the least common. In terms of reliability, each of the 13 variables exhibited strong internal consistency, with high α values ranging from .80 to .98 and ω values also between .81 and .98. Moreover, all variables demonstrated CR values above .70, indicating satisfactory internal consistency. Furthermore, the AVE values exceeded .50 for all variables, indicating robust convergent validity. Finally, the absence of correlations greater than .70 (with all values ranging from .03 to .53) demonstrates suitable discriminant validity between the variables.

Table 4.1

Means, standard deviations, and reliability coefficients for the Tinder Motives Scale-Short Form (39-items TMS-SF)

	1	2	3	4	5	6	7	8	9	10	11	12	13
1	1												
2	.14*	1											
3	.35**	.08	1										
4	.50*	.14*	.39**	1									
5	.10	.03	.30**	.14*	1								
6	.28**	.22**	.27**	.18**	.08	1							
7	.52**	.13	.33**	.43**	.25**	.41**	1						
8	.28**	.20**	.17**	.37**	.18**	.26**	.53**	1					
9	.19**	.16*	.21**	.33**	.49**	.14*	.29**	.24**	1				
10	.26**	.22**	.52**	.33**	.25**	.29**	.18**	.14*	.33**	1			
11	.25**	.13	.26**	.33**	.18**	.20**	.28**	.19**	.39**	.42**	1		
12	.48**	.19**	.38**	.49**	.22**	.27**	.44**	.30**	.32**	.35**	.52**	1	
13	.30**	.11	.26**	.38**	.19**	.22**	.32**	.32**	.35**	.34**	.44**	.42**	1
M	2.50	3.65	2.98	2.78	3.14	2.65	1.80	2.41	3.96	3.75	4.05	2.54	4.10
SD	1.65	1.86	1.68	1.77	1.97	1.88	1.31	1.62	1.86	2.02	1.98	1.62	1.85
α	.92	.91	.80	.91	.94	.98	.93	.83	.84	.94	.92	.84	.86
ω	.92	.92	.81	.92	.94	.98	.93	.86	.86	.95	.92	.86	.88
CR	.92	.92	.80	.92	.94	.98	.94	.87	.86	.95	.92	.87	.88
AVE	.79	.80	.58	.79	.85	.94	.81	.69	.67	.86	.79	.67	.72

Note. 1 = Social approval; 2 = Relationship seeking; 3 = Sexual experience; 4 = Flirting / social skills; 5 = Travelling; 6 = Ex; 7 = Belongingness; 8 = Peer pressure; 9 = Socializing; 10 = Sexual orientation; 11 = Pass time / entertainment; 12 = Distraction; 13 = Curiosity.; α = Cronbach's alpha; ω = McDonald's omega; AVE = Average Variance Extracted; CR = Composite Reliability.

Correlation analysis between the 39-items TMS-SF and the Tinder use and outcomes

The correlations between the TMS-SF and Tinder usage patterns and outcomes are showed in Table 4.2. Significant positive correlations ($p < .05$ and $p < .01$) were observed between Tinder usage and five out of the 13 motivations for using Tinder: relationship seeking, traveling, socializing, sexual orientation, and utilizing it for leisure and entertainment. Furthermore, motivations such as relationship seeking, sexual experiences, socializing, and sexual orientation were significantly and positively associated with the highest number of outcomes ($p < .05$ and $p < .01$). All these associations exhibited small magnitudes of association.

Latent Profile Analysis

Table 4.3 presents the results of the eight models obtained to examine the distribution of participants based on their dark traits and sociosexual orientation in the second study. The fitting criteria were used to determine the optimal model. Thus, models with five to eight

Table 4.2

Bivariate correlations between the Tinder Motives Scale-Short Form (39-items TMS-SF) and the Tinder use and outcomes

TMS factor	Tinder use	Tinder Meet Ups	Tinder Relationship	Tinder Kiss	Tinder Sex	Tinder Sexual Relationship	Tinder Friends
SA	-.01	.01	.11*	.03	.03	.07	.06
RS	.15*	.12*	.27**	.11*	.11*	.04	.08
SE	.09	.15**	.06	.20**	.20**	.28**	.03
F/SS	.05	.02	.04	.03	.03	.08	-.01
T	.13*	.13**	.06	.08	.04	.04	.16**
E	-.02	.05	.10	.06	.07	.08	.04
B	-.08	-.06	-.05	-.06	-.07	-.01	-.02
PP	-.05	-.07	-.02	-.06	-.05	-.04	-.02
S	.20**	.19**	.13*	.12*	.09	.10	.25**
SO	.17*	.19**	.21**	.22**	.21**	.24**	.05
PT/E	.13*	.09*	.07	.06	.05	.07	.04
D	.09	.05	.10	.04	.03	.06	.05
C	-.01	-.02	-.01	-.01	-.02	-.02	.04
M	3.03	5.55	1.08	3.16	2.47	2.08	1.57
SD	2.10	8.73	2.41	4.90	4.11	4.23	2.69

Note. TM = Tinder Motive; SA = Social approval; RS = Relationship seeking; SE = Sexual experience; F/SS = Flirting / social skills; T = Travelling; E = Ex; B = Belongingness; PP = Peer pressure; S = Socializing; SO = Sexual orientation; PT/E = Pass time / entertainment; D = Distraction; C = Curiosity; *p < 0.05; **p < 0.01; Pearson correlation for Tinder use and Kendall's Tau-b for all other variables.

Table 4.3

Model fit indices for 1- through 8-profile solutions

Profiles	Parameters	LL	AIC	SSA-BIC	LRT *p*	Entropy	% smallest group
1	14	–	3951.442	3953.265	–	–	–
2	22	-1961.721	3683.442	3686.307	0.0116	0.894	24.75%
3	30	-1819.721	3575.744	3579.650	0.0154	0.813	20.06%
4	38	-1757.872	3500.761	3505.709	0.0102	0.858	4.13%
5	46	-1712.380	3468.909	3474.899	0.2320	0.873	4.20%
6	54	-1688.455	3453.814	3460.846	0.3878	0.835	4.17%
7	62	-1672.907	3453.285	3461.359	0.9375	0.844	3.96%
8	70	-1659.264	3441.279	3450.394	0.5622	0.861	3.06%

Note. LL = Log-Likelihood; AIC = Akaike Information Criteria; SSA-BIC = Sample Size Adjusted Bayesian Information Criteria; LRT = Likelihood Ratio Test.

profiles were excluded as the *p*-value of the LRT did not meet the significance level ($p >$ .05). Additionally, these models had subgroups that did not reach the recommended 5 % representation. The four-profile model was also discarded due to insufficient representation in the smallest subgroup. Finally, the three-profile model was selected over the two-profile model, considering the combination of remaining indices, i.e., the lower values of LL, AIC, and SSA-BIC with a slightly lower entropy.

The distribution of three profiles yielded the following distribution (Figure 4.1): (1) A profile of participants characterized by having medium-low scores on the dark traits levels and on the sociosexuality orientation, hereafter referred to as the Non-dark and non-sociosexual profile (41.30 % of the sample); (2) A profile characterized by having medium scores on the Machiavellianism and psychopathy levels, but slightly medium-high scores on narcissism and slightly medium-low scores on sadism, and medium-high scores on sociosexuality (being the profile with the highest scores on sociosexuality), hereafter referred to as the Slightly narcissistic and sociosexual profile (38.60 % of the sample); (3) A profile characterized by having high scores on the dark traits levels (being the profile with the highest scores on the Dark Tetrad, especially on psychopathy and sadism) and medium scores on the sociosexuality, although slightly medium-high scores on sociosexual behaviour, hereafter referred to as the High-dark and slightly sociosexual profile (20.10 % of the sample).

Considering the study's high representation of women (67.50 %), the association between gender and profile membership was examined. OR indicated that significant differences were found only when comparing the High-dark and slightly sociosexual profile to the Non-dark and non-sociosexual profile. These findings suggest that being male may be a contributing factor to belonging to the profile characterized by higher scores on the Dark Tetrad and moderate scores on sociosexuality, compared to the profile with low scores on both constructs. Specifically, an OR of 3.27 (95 % Confidence Interval = 1.35 - 7.91) was obtained, indicating that men were up to 3.27 times more likely to be classified in the High-dark and slightly sociosexual profile.

Differences between the profiles in terms of Tinder use motives (ANOVA)

Analysis revealed statistically significant differences ($p \leq .001$, $p \leq .01$, and $p \leq .05$) between the latent profiles and Tinder use motives (Table 4.4). Specifically, significant

Figure 4.1

Profiles of Dark Tetrad and sociosexual orientation
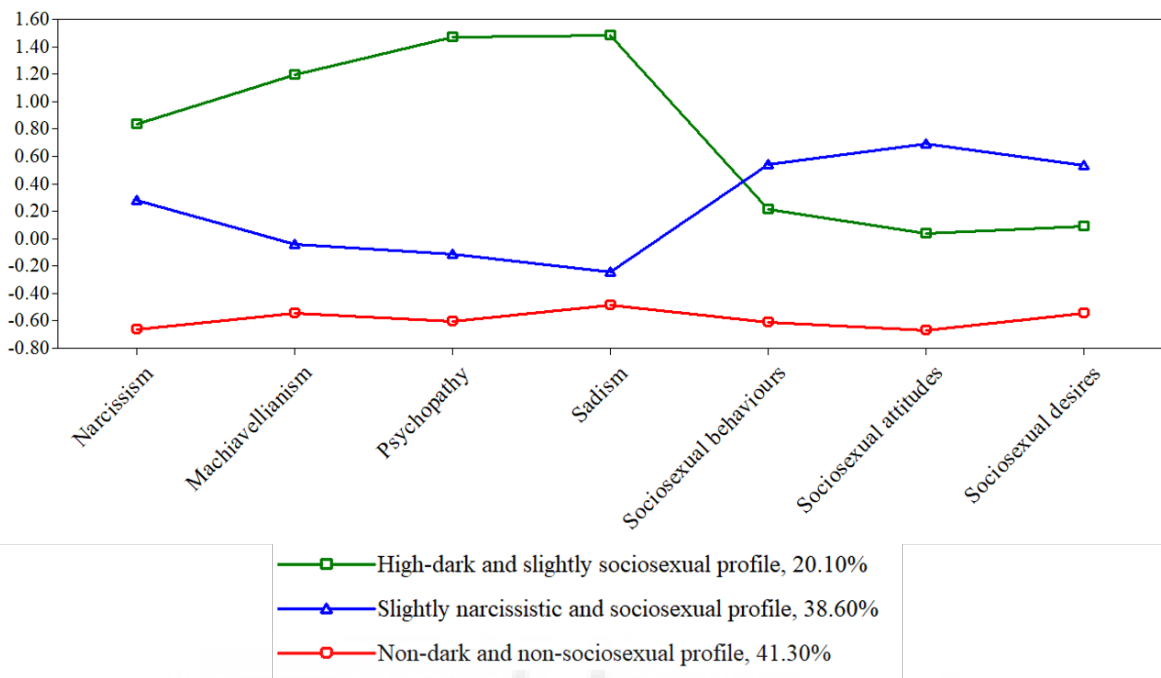
differences were observed in all reasons for app usage, except for relationship seeking and curiosity. While none of the eleven variables showed differences among all three profiles simultaneously, variations were found between at least two profiles for these variables. The Non-dark and non-sociosexual profile and the High-dark and slightly sociosexual profile exhibited the most pronounced discrepancies in terms of app usage motives, with fewer disparities observed between the Slightly narcissistic and sociosexual profile and the High-dark and slightly sociosexual profile.

These findings indicate that individuals in the Slightly narcissistic and sociosexual profile primarily use Tinder for sexual purposes, although they also demonstrate motivations related to social interactions, such as making new friends or exploring new places. In contrast, users in the High-dark and slightly sociosexual profile prioritize reasons associated with social approval, trendiness, reducing social pressures, and enhancing social skills. Additionally, they express motivations for distraction, entertainment, and moving on from past relationships. While not statistically significant, individuals in the Non-dark and non-sociosexual profile appear to use Tinder primarily for romantic relationship purposes, in comparison to the other two profiles.

Table 4.4

Means and standard errors for motives for Tinder use across latent profiles

Variables	Profiles					
	M (SE)			χ^2		
	1. Non-dark and non-sociosexual (*n* = 80)	2. Slightly narcissistic and sociosexual (*n* = 79)	3. High-dark and slightly sociosexual (*n* = 41)	1 vs. 2	1 vs. 3	2 vs. 3
Social approval	-0.18 (0.12)	-0.13 (0.11)	0.62 (0.18)	0.07	14.20***	11.94**
Relationship seeking	0.06 (0.13)	-0.01 (0.13)	-0.11 (0.15)	0.12	0.69	0.23
Sexual experience	-0.55 (0.11)	0.42 (0.13)	0.23 (0.15)	30.70***	22.41***	0.24
Flirting / social skills	-0.18 (0.11)	0.01 (0.13)	0.36 (0.16)	1.10	7.33**	2.46
Travelling	-0.23 (0.12)	0.18 (0.13)	0.12 (0.15)	4.49*	3.22	0.08
Ex	-0.22 (0.11)	-0.02 (0.13)	0.49 (0.16)	1.13	13.61***	5.78*
Belongingness	-0.24 (0.10)	-0.14 (0.11)	0.76 (0.21)	0.44	19.36***	13.63***
Peer pressure	-0.11 (0.12)	-0.08 (0.13)	0.39 (0.16)	0.03	6.42*	5.03*
Socializing	-0.24 (0.13)	0.24 (0.12)	0.02 (0.15)	6.32*	1.65	1.27
Sexual orientation	-0.37 (0.12)	0.30 (0.13)	0.17 (0.15)	12.65***	8.39**	0.41
Pass time / entertainment	-0.28 (0.13)	0.17 (0.12)	0.25 (0.15)	5.38*	7.35**	0.16
Distraction	-0.35 (0.11)	0.15 (0.13)	0.42 (0.16)	7.27**	16.05***	1.50
Curiosity	-0.19 (0.12)	0.14 (0.13)	0.12 (0.14)	2.88	2.73	0.01

Note. M = Mean; SE = Standard error; χ^2 = chi-square value; Asterisk in χ^2 values refers to groups significantly different: *p < .05, **p < .01, ***p < .001.

Study 5, objective 5. The Dirty Twenty: A brief Spanish measure for assessing the Dark Tetrad of personality

Confirmatory Factor Analysis (CFA) of the Dirty Twenty (D20), the new brief measure

In the first study, the D20 scale was created by combining items from the SD3 and ASP scales, as described by Plouffe et al. (2017) (hereafter, we will refer to this abbreviated version as D20, while the full combination of the original 36 items will be referred to as SD3 + ASP to avoid confusion). In constructing the D20, a CFA was conducted to determine the factor loadings of the 36 items (nine per subscale for each of the four Dark Tetrad traits). To adhere to the principle of parsimony, the four items with the lowest loadings within each trait were excluded (Vandekerckhove et al., 2015). Consequently, 16 items were removed, leaving five items for each subscale (all inverse items were excluded).

The CFA results for the 20-item D20 scale, including the four factors, yielded the following fit indices: $\chi^2 = 295.472$, df = 164, $p < .000$, NFI = .976, GFI = .987, CFI = .989, SRMR = .041, RMSEA = .026. Similarly, for the combination of the SD3 and ASP scales and the four traits, the fit indices were as follows: $\chi^2 = 1541.616$, df = 588, $p < .001$, NFI = .931, GFI = .964, CFI = .956, SRMR = .051, RMSEA = .037. In both cases, the fit indices indicated a good fit for the models. Factor loadings ranged from .44 to .56 for D20 narcissism and from .11 to .60 for SD3 + ASP narcissism; from .56 to .75 for D20 Machiavellianism and from .11 to .74 for SD3 + ASP Machiavellianism; from .57 to .70 for D20 psychopathy and from .12 to .71 for SD3 + ASP psychopathy; and from .63 to .72 for D20 sadism and from .20 to .72 for SD3 + ASP sadism.

Descriptive statistics and factorial invariance across gender for the D20

Table 5.1 displays the descriptive statistics, gender differences, and reliability coefficients for the abbreviated version of the scale (D20). The highest scores were observed for the narcissism and Machiavellianism traits, with males scoring significantly higher than females on all four traits in both versions ($p \leq .0125$ with Bonferroni adjustment). In terms of reliability, the subscales of the D20 demonstrated an α ranging from .64 to .81 and a ω ranging from .64 to .82. Similarly, the subscales of the longer combination of SD3 + ASP exhibited an α ranging from .65 to .80 and a ω ranging from .66 to .84. Both scales demonstrated acceptable internal consistency indices, although the narcissism subscale showed relatively weaker reliability in both versions.

Table 5.1

Means (standard deviations), gender differences, and reliability coefficients (Cronbach's alphas and McDonald's omegas) for the combination of the Short Dark Triad (SD3) and the Assessment of Sadistic Personality (ASP) in its short (Dirty Twenty —D20) and full (SD3 + ASP) version

	Total group (N = 1188)	Women (n = 928)	Men (n = 260)	t	d	α	ω
D20							
Narcissism	6.50 (3.49)	6.12 (3.38)	7.83 (3.54)	-7.13*	0.49	.64	.64
Machiavellianism	6.29 (4.24)	5.84 (4.18)	7.93 (4.08)	-7.17*	0.51	.80	.81
Psychopathy	3.72 (3.54)	3.36 (3.37)	5.00 (3.81)	-6.71*	0.46	.76	.77
Sadism	1.80 (2.91)	1.50 (2.58)	2.86 (3.68)	-6.78*	0.43	.81	.82
SD3 + ASP							
Narcissism	12.79 (5.09)	12.29 (5.01)	14.56 (5.00)	-6.47*	0.45	.65	.66
Machiavellianism	14.52 (6.35)	13.86 (6.33)	16.86 (5.87)	-6.87*	0.49	.80	.81
Psychopathy	7.18 (5.25)	6.46 (4.95)	9.76 (5.51)	-9.24*	0.63	.72	.75
Sadism	3.69 (4.53)	3.17 (4.02)	5.55 (5.63)	-7.68*	0.49	.80	.84

Note. t = Student's t; d = Cohen's d; α = Cronbach's alpha; ω = McDonald's omega; *$p <$ .0125 (Bonferroni fit).

The D20 demonstrated a good fit to the data and showed similar internal consistency to the original 36-item version. Consequently, a factorial invariance analysis was conducted between genders for this version. The fit indices for the invariance models, which assessed whether the factor structure of the scale was equivalent across genders, were obtained. The results revealed evidence of structural factorial invariance across all genders, indicating that the Spanish version of the D20 exhibited strong factorial invariance between genders: $\chi^2 =$ 41.36, df = 360, CFI = 0.989, ΔCFI = 0.002, RMSEA = 0.023, and ΔRMSEA = 0.002.

Bivariate correlations of the D20 and the SD3 + ASP, and the study variables (convergent and divergent validity)

In terms of the associations observed between the Dark Tetrad traits within each of the two scales (20-item D20 and 36-item SD3 + ASP), as well as between the scales themselves, significant positive correlations were found ($p < .01$) with moderate effect sizes. Additionally, correlations were observed between the corresponding traits assessed by both scales ($p < .01$), demonstrating strong associations (Table 5.2).

Regards the bivariate correlations between the dark traits of both scales (D20 and SD3 + ASP again) and the other study variables were obtained to examine the convergent and divergent validity of the scales. Significant positive correlations ($p < .01$) were found

Table 5.2

Bivariate correlations between the combination of the Short Dark Triad (SD3) and the Assessment of Sadistic Personality (ASP) in its short (Dirty Twenty —D20) and full (SD3 + ASP) version

D20	D20				SD3 + ASP			
	N	M	P	S	N	M	P	S
N	1							
M	.39**	1						
P	.39**	.63**	1					
S	.26**	.45**	.56**	1				
SD3 + ASP								
N	.88**	.35**	.36**	.24**	1			
M	.40**	.93**	.60**	.41**	.33**	1		
P	.37**	.56**	.90**	.54**	.37**	.51**	1	
S	.26**	.44**	.56**	.91**	.26**	.39**	.55**	1

Note. N = Narcissism; M = Machiavellianism; P = Psychopathy; S = Sadism; **$p < .01$.

with the Dark Tetrad traits measured by the other instruments (DTDD and SISS). Significant correlations ($p < .01$ and $p < .05$) were also observed with the personality traits of the HEXACO model, except for openness to experience in the case of Machiavellianism and sadism (in both scales of the Dark Tetrad), and agreeableness and conscientiousness in the case of narcissism (in D20 and SD3 + ASP, respectively). The relationships with the HEXACO traits were mostly negative, except for the positive correlations between narcissism and extraversion and openness to experience.

Regarding the SDQ variables, all correlations were significant ($p < .01$ and $p < .05$), except for the absence of a significant correlation between narcissism and prosocial behaviour. The four Dark Tetrad traits showed positive correlations with the SDQ variables, except for narcissism with emotional symptoms and relationship problems, and Machiavellianism, psychopathy, and sadism with prosocial behaviour, which exhibited negative correlations. Overall, the correlations between the study variables and the dark traits measured by the D20 and SD3 + ASP were highly consistent. All correlations are presented in Table 5.3.

Test-retest reliability of the D20 and SD3 + ASP: Intra-Class Correlation (ICC)

In the second study, the ICC analysis revealed values ranging from .82 to .89 for the D20 subscales and values between .85 and .90 for the SD3 + ASP subscales, both with a 95

% confidence interval (Table 5.4). Based on the guidelines of Koo and Li (2016), the D20 scales demonstrated good to excellent reliabilities, with the confidence intervals supporting these findings, except for the narcissism subscale, which showed moderate to good reliability. Similar results were obtained for the combination of the SD3 and ASP scales. However, in this case, the narcissism scale also demonstrated excellent reliability, as indicated by the upper bound of the confidence interval.

Table 5.3

Bivariate correlations between the study variables and the combination of the Short Dark Triad (SD3) and the Assessment of Sadistic Personality (ASP) in its short (Dirty Twenty — D20) and full (SD3 + ASP) version

Variables	D20 / SD3 + ASP				
	α / ω	N	M	P	S
DTDD					
Narcissism	.82/.83	.44**/.48**	.41**/.40**	.33**/.31**	.33**/.33**
Machiavellianism	.78/.79	.30**/.30**	.54**/.52**	.51**/.48**	.48**/.48**
Psychopathy	.62/.64	.26**/.25**	.38**/.36**	.47**/.47**	.38**/.40**
SISS					
Sadism	.70/.84	.20**/.21**	.38**/.35**	.48**/.50**	.72**/.72**
HEXACO-60					
Honesty	.68/.69	-.29**/-.31**	-.43**/-.40**	-.38**/-.37**	-.30**/-.31**
Emotionality	.70/.70	-.13**/-.16**	-.08**/-.07*	-.15**/-.23**	-.13**/-.15**
Extraversion	.77/.78	.27**/.38**	-.14**/-.14**	-.13**/-.10**	-.16**/-.13**
Agreeableness	.69/.69	-.04/-.06*	-.24**/-.21**	-.33**/-.31**	-.25**/-.24**
Conscientiousness	.74/.74	-.06*/-.05	-.18**/-.14**	-.22**/-.26**	-.18**/-.19**
Openness	.73/.73	.10**/.09**	-.04/-.03	-.07*/-.08**	.01/-.01
SDQ					
Emotional symptoms	.79/.80	-.09**/-.18**	.14**/.15**	.10**/.06	.12**/.08**
Conduct problems	.32/.42	.21**/.24**	.34**/.31**	.42**/.44**	.29**/.32**
Hyperactivity	.58/.59	.11**/.09**	.19**/.16**	.19**/.24**	.15**/.16**
Relationship problems	.50/.51	-.07*/-.12**	.21**/.23**	.21**/.19**	.21**/.19**
Prosocial behaviour	.64/.66	.02/.01	-.22**/-.20**	-.27**/-.27**	-.21**/-.24**

Note. N = Narcissism; M = Machiavellianism; P = Psychopathy; S = Sadism; DTDD = Dark Triad Dirty Dozen; SISS = Short Sadistic Impulse Scale; HEXACO-60 = HEXACO-60 Personality Inventory-Revised; SDQ = Strengths and Difficulties Questionnaire; α = Cronbach's alpha; ω = McDonald's omega; **$p < .01$; *$p < .05$.

Bivariate correlations of D20 and the SD4: convergent validity of the D20

In the third study, the bivariate correlations between the new scale, i.e., the D20, and the 28-item SD4 version by Paulhus et al. (2021) showed significant and positive

correlations with all traits ($p < .01$ and $p < .05$) of the SD4, with small to moderate magnitudes of association (Table 5.5).

Table 5.4

Test-retest reliability of the combination of the Short Dark Triad (SD3) and the Assessment of Sadistic Personality (ASP) in its short (Dirty Twenty —D20) and full (SD3 + ASP) version: Intra-Class Correlation (ICC)

Single measures		95% confidence interval		F test with true value 0		
	Intra-Class Correlation	Lower bound	Upper bound	Value	df1	df2
D20						
Narcissism	.82	.72	.89	5.96***	75	75
Machiavellianism	.89	.82	.93	8.81***	75	75
Psychopathy	.84	.75	.90	6.39***	75	75
Sadism	.84	.75	.90	6.20***	75	75
SD3 + ASP					75	75
Narcissism	.85	.76	.90	6.67***	75	75
Machiavellianism	.90	.84	.94	10.34***	75	75
Psychopathy	.88	.82	.92	8.91***	75	75
Sadism	.85	.76	.91	6.68***	75	75

Note. ***$p < .001$.

Table 5.5

Bivariate correlations between the Dirty Twenty (D20) and the Short Dark Tetrad (SD4)

D20	SD4			
	Narcissism	Machiavellianism	Psychopathy	Sadism
Narcissism	.66**	.22**	.30**	.32**
Machiavellianism	.25**	.61**	.29**	.60**
Psychopathy	.30**	.34**	.54**	.59**
Sadism	.17*	.33**	.40**	.57**

Note. **$p < .01$; *$p < .05$.

Study 6, objective 6. Objective and indirect assessment instruments of the Dark Triad and Dark Tetrad 20 years later: a systematic review

In the initial search, a total of 8537 studies were identified from the databases, and an additional two studies were obtained from other sources. Out of these, 3315 duplicates were removed, and 5035 studies were excluded during the two screening phases for not meeting the inclusion criteria. Ultimately, 189 studies were included in the final review as they met the inclusion criteria.

The primary reasons for excluding studies during the initial screening were their lack of relevance to the research topic (some articles contained the terms "dark," "triad," and "tetrad," but were unrelated to the Dark Triad or Dark Tetrad constructs) or their failure to measure at least three of the four traits comprising the Dark Triad. During the second screening, many studies were excluded due to their failure to utilize an objective measure for assessing characteristics related to the traits of interest. Given the lack of uniformity in referencing objective measures, it was challenging to include specific terms in the search equation to filter out relevant studies. Consequently, all studies, regardless of their use of objective measures, had to be initially considered.

Evaluation of the methodological quality of the selected studies revealed that fou studies were of excellent quality, 42 were deemed good quality, 127 were categorized as fair quality, and 17 were classified as poor quality. Some studies lacked sufficient methodological details, such as comprehensive descriptions of the sampling strategy, eligibility criteria, participant selection methods, or specific statistical approaches.

Characteristics of the included studies and of the indirect instruments used to assess the Dark Triad and Dark Tetrad traits

Table 6.1 presents a comprehensive overview of the 189 studies included in the review, highlighting the variables of interest for this study. It is notable that most of these studies were published from 2016 onwards, with 2021 having the highest number of publications specifically employing objective measures to assess constructs related to dark traits.

In the analysis of all the studies, a total of 268 measures (considering that some of them were used more than once) were identified that indirectly assessed Dark Triad and/or Dark Tetrad traits. Specifically, 89.60 % ($n = 241$) of these measures were employed to

Table 6.1

Instruments for indirect assessment of Dark Triad and Dark Tetrad traits, objectively measured variables, and relationships between them

Study	Indirect assessment			Results				Conclusion
	Instrument	Variable	Reliability	With P	With N	With M	With S	
Paulhus and Williams (2002)	1-Over Claiming Questionnaire (OCQ)	General Intelligence/ Convergent thinking	α = .84	r = .09	r = .09	r = .04	NI	None
	1-OCQ	Over-claiming bias	α = .93	r = .09	r = .17	r = .08	NI	N
	1-Wonderlic Personnel Test	General Intelligence/ Convergent thinking	NI	r = .05 and .13	r = .05 and .15	r = .04 and .20	NI	P, N, M
MacNeil (2008)	1- Multidimensional Aptitude Battery- Vocabulary Subtest (MAB-II)	Verbal ability	NI	NI	NI	NI	NI	NI
Jonason, Koenig et al. (2010)	2-Monetary dilemma	Risky decision making	NI	NI	NI	NI	NI	NI
Jonason, Li et al. (2010)	2-Scenarios and Amount allocation task	Decision making with social value (sharing)	NI	r = .10 – .20	r = .10 – .20	r = .12 – .17	NI	P, N, M
Williams et al. (2010)	2-Essays and Turn-It-In program	Cheating behaviour	α = .57	r = .22	r = .12	r = .14	NI	P, N, M
	1-UBC Word test	Verbal ability	α = .90	r = .14	r = .10	r = .01	NI	None
Holtzman (2011)	4-Questionnaire *ad hoc*	Dark Triad/Tetrad	α = 0 – .84	r = .03 and .13	r = .19 and .33	r = .16 and .22	NI	NI
Jonason et al. (2011)	2-Budget-allocation task	Preferences in social relations	NI	r = .02 – .22	r = .02 – .22	r = 0 – .13	NI	P, N, M
Jonason et al. (2012)	2-Budget-allocation task	Preferences in social relations	NI	r = .16 – .28	r = .22 – .31	r = .10 – .19	NI	P, N, M
Jonason and Schmitt (2012)	2-Budget-allocation task	Preferences in social relations	NI	r = .01 – .21	r = .07 – .41	r = .04 – .22	NI	P, N, M
Rauthmann (2012)	2-The NASA game	Cooperative attitude	NI	NI	NI	NI	NI	NI
Sumner et al. (2012)	6(machine-learning)-LIWC software and WEKA toolkit	Networking language	NI	r = 0 – .19	r = 0 – .16	r = 0 – .13	NI	P, N, M

Study	Indirect assessment			Results				Conclusion
	Instrument	Variable	Reliability	With P	With N	With M	With S	
Ashton-James and Levordashka (2013)	6(observation)-Interviews and observations	Mimicry behaviour	$r_{intraclass}$ = .41 and .79	NI	F = 0.75 – 6.86	NI	NI	N
Buckels et al. (2013)	2-Bug-crunching paradigm	Sadistic task choice	NI	NI	NI	NI	OR = 3.41	S
	1-White-noise paradigm	Harmful behaviour	NI	r_p = .22 – .62	r_p = .04 – .39	r_p = .04 – .12	r_p = .40 – .57	P, N, S
Crysel et al. (2013)	2-Blackjack task	Risky decision making	NI	r = .08	r = .13	r = .09	NI	N
	2-Balloon analogue risk task (BART)	Risky decision making	NI	r = .08	r = .01	r = .10	NI	None
	2-Discounting task	Risky decision making	NI	r = .02 and .10	r = .12 and .17	r = .02 and .05	NI	N
Holtzman and Strube (2013a)	4-Questionnaire *ad hoc*	Dark Triad/Tetrad	α = .04 – .78	r = .33	r = .48	r = .26	NI	NI
Holtzman and Strube (2013b)	4-Questionnaire *ad hoc*	Dark Triad/Tetrad	α = .34 – .80	$r_{intraclass}$ = .82	$r_{intraclass}$ = .51	$r_{intraclass}$ = .67	NI	P, N, M
Jones (2013a)	3-Website advertisements and items	Racial, violent, and political attitudes	α = .92 – .97	r = .01 – .36	r = .01 – .17	r = .09 – .34	NI	P, M
Jones (2013b)	2-Gambling task	Risky decision making	NI	r = .01 – .30	r = .07 – .39	r = .02 – .19	NI	P, N, M
Muris et al. (2013)	4-Dirty Dozen for Youths (DD-Y)	Dark Triad/Tetrad	α = .71 – .76	r_p = .23	r_p = .15	r_p = .32	NI	P, M
Baughman et al. (2014)	3-Scenarios and items	Cheating behaviour	α = .64 – .82	r = .06 – .46	r = .07 – .28	r = .10 – .34	NI	P, N, M
Black et al. (2014)	3-Video clips and items	Interpersonal assessment of vulnerability in others	NI	r = .20 – .33	r = .21 – .28	r = .22 – .27	NI	P, N, M
Djeriouat and Trémolière (2014)	3-Bartels' and Bartels et al.'s dilemmas	Utilitarian decision making	α = .87	r = .38	r = .18	r = .29	NI	P, N, M
James et al. (2014)	3-Scenarios and items	Satisfaction for others' suffering	α = .74 – .82	r = .29 – .44	r = .10 – .21	r = .14 – .23	NI	P, N, M

Study	Indirect assessment			Results				Conclusion
	Instrument	Variable	Reliability	With P	With N	With M	With S	
Jones (2014)	2-The ultimatum game	Risky decision making	NI	$r = .18 - .23$	$r = .02 - .18$	$r = .08 - .22$	NI	P, N, M
Jones and Olderbak (2014)	3-Scenarios and Tactics for Obtaining Sex Scale (TOSS)	Sexual tactics	$\alpha = .77 - .90$	$r = .02 - .58$	$r = .09 - .39$	$r = .03 - .30$	NI	P, N, M
Jones and Paulhus (2014)	4-Short Dark Triad (SD3)	Dark Triad/Tetrad	$\alpha = .62 - .86$	$r = .57$	$r = .34$	$r = .42$	NI	P, N, M
Lämmle et al. (2014)	2-White-Noise Paradigm	Self-harming behaviour	NI	WRMR = 0.39	WRMR = 0.32	WRMR = 0.25	NI	N
Porter et al. (2014)	3-Scenarios and items	Satisfaction for others' suffering	$\alpha = .78 - .90$	$r = .21$ and .25	$r = .15$ and .17	$r = .09$ and .26	NI	P, M
	5-Facial Action Coding System (FACS)	Satisfaction for others' suffering	$r_{intraclass} = .78 - .88$	$r = .08$ and .27	$r = .04$ and .23	$r = .04$ and .22	NI	P, N, M
Rasmussen and Boon (2014)	3-Scenario and items	Emotion management	$\alpha = .87$ and .90	$r = .01 - .41$	$r = .14 - .22$	$r = .10 - .48$	NI	P, N, M
D'Souza and de Lima (2015)	3-Assertions	Opportunistic decision making	NI	NI	NI	NI	NI	NI
Jonason et al. (2015)	3-Dating advertisement paradigm and items	Preferences in social relations	$\alpha = .69 - .91$	$r = .02 - .43$	$r = .01 - .37$	$r = .03 - .41$	NI	P, N, M
Kapoor (2015)	1-Implicit Association Test (IAT)	Divergent thinking/Creativity	NI	$B = 13.71 - 48.25$	$B = 2.64 - 29.20$	$B = 11.46 - 39.75$	NI	P, M
Schneider et al. (2015)	3-Scenario and question	Social desirability	NI	Z-test = 2.32	Z-test = 1.07	NI	NI	P
Wright et al. (2015)	2-Deceptive interactive task (DeceIT)	Lie detection	NI	$r = .06$	$r = .05$ and .15	$r = .03$ and .10	NI	None
	2-DeceIT	Ability/Attitude to lie	NI	$r = .05$ and .08	$r = .11$ and .18	$r = .09$ and .10	NI	None
Zhang et al. (2015)	1-Mayer–Salovey–Caruso Emotional Intelligence Test (MSCEIT)	Emotional intelligence	$\alpha = .91$	$r = .23$	$r = .16$	$r = .37$	NI	P, N, M

Study	Indirect assessment			Results				Conclusion
	Instrument	Variable	Reliability	With P	With N	With M	With S	
Carre and Jones (2016)	2-BART	Risky decision making	NI	β = .04 – .28	β = 0 – .14	β = .01 – .24	NI	None
	2-IOWA Gambling Task (IGT)	Risky decision making	NI	NI	NI	NI	NI	None
Clark et al. (2016)	2-The Thieves' Game	Theft decision making	NI	NI	NI	β = .03	NI	None
Crossley et al. (2016)	2-Negotiation task	Ability to negotiate	NI	r = .03 – .14	r = .01 – .08	r = .04 – .21	NI	M
Czarna et al. (2016)	2-Triple Dominance Measure (SVO)	Decision making with social value (sharing)	NI	NI	NI	NI	NI	NI
	3-Bartels and Pizarro's dilemmas	Utilitarian decision making	α = .54	r = .25	r = .20	r = .16	NI	P
Dahmen-Wassenberg et al. (2016)	1-Creative explanations task (CE)	Divergent thinking/Creativity	NI	r = .10 and .13	r = .02 and .03	r = .10 and .16	NI	P, M
	1-Alternate Uses task (AUT)	Divergent thinking/Creativity	α = .91	r = .10 and .16	r = .06 and .08	r = .13 and .16	NI	P, M
	1-CE and AU	Divergent thinking/Creativity	NI	r = .15	r = .02	r = .16	NI	P, M
Galić (2016)	3-Conditional Reasoning Test for Aggression (CRT-A)	Conditional reasoning for aggression	α = .65	r = .02	r = .04	r = .11	NI	None
Jankowski et al. (2016)	3-The Emotional Intelligence Test (TIE)	Emotional intelligence	α = .60 – .88	NI	NI	NI	NI	NI
Jauk et al. (2016)	3-Speed dating and items	Preferences in social relations	NI	β = 0.01 – 0.25	β = 0 – 0.36	β = 0 – 0.28	NI	P, N, M
Kapoor and Khan (2016)	1-AUT	Divergent thinking/Creativity	$r_{intraclass}$ = .67 – .91	r = 0 – .40	r = 0 – .21	r = .01 – .34	NI	P, N, M
Lyons and Blanchard (2016)	3-Psychomorph software program and items	Preferences in social relations	NI	NI	r = .17	NI	NI	N
Majors (2016)	2-Experimental Task	Aggressive behaviour	NI	t-test = 3.05	t-test = 1.99	t-test = 3.08	NI	P, N, M

Study	Indirect assessment			Results				Conclusion
	Instrument	Variable	Reliability	With P	With N	With M	With S	
Malesza and Ostaszewski (2016a)	2-Delay-discounting task	Risky decision making	NI	$r = .18$	$r = .06$	$r = .09$	NI	P
	1-Stop-Signal task	Risky decision making	NI	$r = .16$	$r = .12$	$r = .06$	NI	P, N
Malesza and Ostaszewski (2016b)	2-Probabilistic-discounting task	Risky decision making	NI	$r = .04$	$r = .52$	$r = 0$	NI	N
	2-BART	Risky decision making	NI	$r = .19$	$r = .35$	$r = .01$	NI	P, N
McCain et al. (2016)	3-Smartphone app and expert appraisal	Exhibitionism in social networks	$r_{intraclass} = .40 - .75$	$r = 0 - .23$	$r = 0 - .18$	$r = .02 - .20$	NI	P, N, M
	6(app data)-Iconosquare website	Exhibitionism in social networks	NI	$r = 0 - .24$	$r = .01 - .22$	$r = .01 - .21$	NI	P, N, M
Panicheva et al. (2016)	6(machine-learning)-LIWC software	Networking language	NI	$r = .01 - .11$	$r = .02 - .08$	$r = .05 - .11$	NI	P, N, M
Parson (2016)	3-Scenarios and items	Person-Organization Fit	$\alpha = .93$	$r = .10 - .19$	$r = 0 - .23$	$r = 0 - .23$	NI	P, N, M
	3-Scenarios and items	Unethical decision making	$\alpha = .70$	$r = .33$	$r = .23$	$r = .20$	NI	P, N, M
Pfattheicher (2016)	5-Saliva samples	Testosterone	$r_{intraclass} = .67$	$r = .01$	$r = .18$	$r = .04$	NI	N
	5-Saliva samples	Cortisol	$r_{intraclass} = .82$	$r = .04$	$r = .22$	$r = .01$	NI	N
Preotiuc-Pietro et al. (2016)	6(machine-learning)-LIWC software	Networking language	NI	$r_p = 0 - .19$	$r_p = 0 - .13$	$r_p = 0 - .12$	NI	P, N, M
Ranadive (2016)	2-Financial Decision-making game	Risky decision making	NI	$\gamma = 0.20$	$\gamma = 0.15$	$\gamma = 0.26$	NI	None
Roeser et al. (2016)	2-Message-Task	Cheating behaviour	NI	$B = 0.10$	$B = 0.40$	$B = 0.68$	NI	M
	1-Matrices-task	Cheating behaviour	NI	$B = 0.51$	$B = 0.06$	$B = 0.16$	NI	P
Shobe and Desimone (2016)	5-Edinburgh Handedness Inventory (EHI)	Hand preference	NI	$r = .14$	NI	NI	NI	P
Trémolière and Djeriouat (2016)	3-Scenarios and items	Minimization of intent and responsibility	NI	$r = .01 - .51$	$r = 0 - .26$	$r = .02 - .34$	$r = 0 - .58$	P, N, M, S

Study	Indirect assessment			Results				Conclusion
	Instrument	Variable	Reliability	With P	With N	With M	With S	
Zhao et al. (2016)	3-Scenarios and items	Bribe-taking intention	α = .80 and .85	r = .19 and .30	r = .18 and .20	r = .28 and .34	NI	P, N, M
	3-Paradigm/scenarios and items	Belief in good luck	α = .79 and .89	r = .17 and .18	r = .26 and .33	r = .09 and .26	NI	P, N, M
Jonason et al. (2017)	1-Alternative uses objects	Divergent thinking/Creativity	α = .86 and .99	r = .05 – .21	r = .01 – .14	r = 0 – .16	NI	P, N, M
Jonason and Lavertu (2017)	5-Questionnaire ad hoc	Reproductive health problems	NI	r = .18	r = .14	r = .04	NI	P, N
	5-Questionnaire ad hoc	Amount of pain	NI	r = .28	r = .21	r = .28	NI	P, N, M
	5-Questionnaire ad hoc	Number of miscarriages	NI	r = .20	r = .15	r = .14	NI	P, N, M
	5-Questionnaire ad hoc	Cycle length	NI	r = .15	r = .20	r = .25	NI	P, N, M
	5-Questionnaire ad hoc	Waist-to-hip ratio	NI	r = .07	r = .19	r = .15	NI	N, M
Jones and De Roos (2017)	3-Scenario and Mate Retention Inventory (MRI)	Negative mate retention tactics	NI	r = .29	r = .23	r = .20	NI	P, N, M
Jones and Paulhus (2017)	2-The virtual coin-flipping task	Cheating behaviour	NI	r = .15 – .23	r = .10 – .21	r = .05 – .21	NI	P, N, M
	2-Videos and the virtual coin-flipping task	Cheating behaviour	NI	r = .01 and .07	r = .05 and .10	r = .03 and .20	NI	M
	2-Virtual game for a financial bonus	Cheating behaviour	NI	r = .24	r = .05	r = .24	NI	P, M
	1-OCQ	Over-claiming bias	NI	r = .04 – .25	r = .03 – .29	r = .05 – .14	NI	P, N, M
Kornilova and Krasavtseva (2017)	2-IGT	Risky decision making	NI	r_p = 0 – .36	r_p = .01 – .28	r_p = .02 – .29	NI	P, N, M
Lee and Gibbons (2017)	3-Films and items	Connection with others' suffering	α = .62 – .88	r = .18 – .47	r = .02 – .20	r = .07 – .15	NI	P, N
Lopes and Yu (2017)	3-Facebook profiles and Trolling comment scale	Online trolling behaviours	α = .68 and .70	r = .30 and .45	r = .08	r = .16 and .22	NI	P, M
	3-Facebook profiles and Social comparison scale	Social comparation	α = .87 and .93	r = .13 and .17	r = .28 and .34	r = .02 and .22	NI	N, M

Study	Indirect assessment			Results				Conclusion
	Instrument	Variable	Reliability	With P	With N	With M	With S	
Lyons and Brockman (2017)	3-Emotional video clips	Emotional adequacy	NI	$r = .04 – .33$	$r = .01 – .22$	$r = .02 – .30$	NI	P, N, M
Lyons et al. (2017)	3-Video clips and question	Lie detection	NI	$r = .01$ and .07	$r = .05$ and .22	$r = .02$ and .10	NI	N, M
Miller et al. (2017)	4-Dirty Dozen (DD) and SD3	Dark Triad/Tetrad	$r = .41 – .51$	$r = .29$	$r = .17$	$r = .33$	NI	P, M
Oostrom et al. (2017)	3-Situational judgment tests (SJTs)	Decision making in situational judgments	$\alpha = .53 – .56$	$r = .02 – .35$	$r = .07 – .20$	$r = .10 – .31$	NI	P, M
	1- Matrices-task	Cheating behaviour	NI	$r = .15$	$r = .15$	$r = .16$	NI	P, N, M
Pina et al. (2017)	3-Scenarios and Revenge Porn Proclivity Scale	Revenge Porn Proclivity	$\alpha = .76 – .87$	$r = .13 – .36$	$r = .09 – .29$	$r = .19 – .34$	$r = .02 – .16$	P, N, M
Wang (2017)	1-Experimental task to earn points	Productive and counterproductive effects of recognition	NI	NI	NI	NI	NI	P, N, M
Wissing and Reinhard (2017)	3-Videos and items	Lie detection	$\alpha = .84$ and .94	$r = .05 – .20$	$r = 0 – .12$	$r = .02 – .16$	NI	P
Amiri and Behnezhad (2018)	2-International Affective Picture System (IAPS)	Emotional recognition	NI	NI	NI	NI	NI	NI
	3-Greene's dilemmas	Utilitarian decision making	NI	NI	NI	NI	NI	NI
Anderson and Cheers (2018)	1-Go/No-go Association Task (GNAT)	Racially prejudiced attitudes	$\alpha = .72$ and .78	$r = .09$	$r = .07$	$r = .19$	NI	None
Ball et al. (2018)	3-Scenarios with Propensity for angry driving scale (PADS)	Aggressive driving behaviours	$\alpha = .70 – .93$	$r = .22 – .50$	$r = .12 – .37$	$r = .17 – .45$	NI	P, N, M
Bogolyubova et al. (2018)	6(machine-learning)-PyMorphy analyser	Networking language	NI	$r = .07 – .11$	$r = .05 – .08$	$r = .06 – .11$	NI	P, N, M
Carre et al. (2018)	3-Consumer trust scale with scenario	Trust in company after data breach	$\alpha = .88 – .92$	$r = .28 – .40$	$r = .09 – .21$	$r = .10 – .13$	NI	P, N, M
Curtis et al. (2018)	3-Development of phishing emails and evaluation of others	Internet/social network uses	NI	$\beta = 0.02 – 0.30$	$\beta = 0.03 – 0.18$	$\beta = 0.01 – 0.16$	NI	P, N, M

Study	Indirect assessment			Results				Conclusion
	Instrument	Variable	Reliability	With P	With N	With M	With S	
Dane et al. (2018)	5-Saliva samples	Cortisol	$CV_{intra-assay}$ = 4.43%	r_p = .43	r_p = .32	r_p = .42	NI	P, M
	5-Saliva samples	Testosterone	$CV_{intra-assay}$ = 3.52%	r_p = .12	r_p = .21	r_p = .54	NI	M
	5-Saliva samples and Two truths and a lie game	Cortisol	$CV_{intra-assay}$ = 4.43%	r_p = .49 and .64	r_p = .39 and .44	r_p = .22 and .38	NI	P, N
	5-Saliva samples and Two truths and a lie game	Testosterone	$CV_{intra-assay}$ = 3.52%	r_p = .52	r_p = .21	r_p = .59	NI	P, M
Deutchman and Sullivan (2018)	2-Prisoner's dilemma	Decision making with social value (sharing)	NI	B = 0.02	B = 0.01	B = 0.21	NI	M
Greenier (2018)	3-Scenarios (hypotheticals) and items	Satisfaction for others' suffering	α = .69	r = .23	r = .18	r r = .32	NI	P, N, M
	3-Scenarios (real) and items	Satisfaction for others' suffering	NI	r = .10	r = .13	r = .02	NI	None
Harrison et al. (2018)	3-Scenarios and items	Unethical behaviour	α = .86 – .98	r = .14 – .70	r = .08 – .27	r = .04 – .61	NI	P, N, M
	3-Used 4G iPhone and items	Unethical behaviour	NI	β = .01 – .30	β = .01 – .21	β = .10 – .38	NI	P, N, M
Hart et al. (2018a)	3-Scenarios and items	Political preferences	α = .90 – .99	r = .07 – .18	r = .06 – .13	r = .04 – .15	NI	P, M
Hart et al. (2018b)	3-Scenario and items	Beneficial impression management	α = .76 – .97	β = .29	β = .17	β = .32	NI	P, N, M
Jackson (2018)	1-Baddeley reasoning test	General Intelligence/ Convergent thinking	NI	r = .10	r = .12	r = .12	NI	P, N, M
Karampournioti et al. (2018)	1-Message and i2 BrandREACT	Implicit brand attitude	Split-half = .87	NI	NI	NI	NI	NI
	3-Message and Interpersonal Reactivity Index (IRI)	Empathy	α = .69 – .77	NI	NI	NI	NI	NI
	3-Message and items	Unethical decision making	α = .88 and .93	NI	NI	NI	NI	NI

Study	Indirect assessment			Results				Conclusion
	Instrument	Variable	Reliability	With P	With N	With M	With S	
Keblusek (2018)	3-Message and items	Gossip recognition memory	NI	$r = .07$	$r = .01$	$r = .01$	NI	None
	3-Message, open question and counting units	Gossip recognition memory	NI	$r = .01$ and .02	$r = 0$ and .03	$r = .01$ and .04	NI	None
Kowalski et al. (2018)	1-Raven's Standard Progressive Matrices (SPM)	General Intelligence/ Convergent thinking	NI	$\beta = 0.18$	$\beta = 0$	$\beta = 0.31$	NI	M
Law et al. (2018)	1-Composite Faces–Short Form	Emotional recognition	$\alpha = .64$	NI	NI	NI	NI	NI
	1-Visual Search for Faces	Emotional recognition	$\alpha = .89$	NI	NI	NI	NI	NI
	1-Program N-Watch and a voice	Auditory skills	$\alpha = .77$	NI	NI	NI	NI	NI
	1-Tonal patterns	Auditory skills	$\alpha = .52$	NI	NI	NI	NI	NI
	1-Rhythmic pattern pairs	Auditory skills	$\alpha = .64$	NI	NI	NI	NI	NI
	1-BEFKI-Gc	General Intelligence/ Convergent thinking	$\alpha = .54$	NI	NI	NI	NI	NI
	1-Vocabulary Test	General Intelligence/ Convergent thinking	$\alpha = .68$	NI	NI	NI	NI	NI
	1-BEFKI-Gf	General Intelligence/ Convergent thinking	$\alpha = .69$	NI	NI	NI	NI	NI
	1-Esoteric Analogies Test (EAT)	General Intelligence/ Convergent thinking	$\alpha = .70$	NI	NI	NI	NI	NI
	3-Lie detection paradigm	Lie detection	$\alpha = .15$	NI	NI	NI	NI	NI
Modic et al. (2018)	3-Insurance claim task	Fraudulent decision making	NI	$r = .09 – .23$	$r = .04 – .13$	$r = .12 – .14$	NI	P, N, M
Moshagen et al. (2018)	2-Dictator game	Decision making with social value (sharing)	NI	$r = .14$ and .32	$r = .04$ and .19	$r = .17$ and .34	$r = .08$ and .27	P, N, M, S
	2-Coin-toss-task	Cheating behaviour	NI	$r = .17$	$r = .12$	$r = .13$	$r = .10$	P, N, M, S
Moskvichev et al. (2018)	6(machine-learning)-Latent Dirichlet Allocation technique	Networking language	NI	$r = .05 – .07$	$r = .05 – .08$	$r = .05 – .07$	NI	P, N, M

Study	Indirect assessment			Results				Conclusion
	Instrument	Variable	Reliability	With P	With N	With M	With S	
Noser et al. (2018)	5-ImageJ software	Facial width-to-height ratio	$\alpha = .99$	$r_p = .10$	$r_p = .03$	$r_p = .09$	NI	None
	5-Saliva samples	Testosterone	$CV_{\text{intra/inter-assay}} =$ 1.47% and 6.69%	$r_p = .06$	$r_p = .21$	$r_p = .12$	NI	None
Pajevic et al. (2018)	1-Reading the Mind in the Eyes test (RMET)	Emotional recognition	$\alpha = .51$	$r = .12$	$r = .03$	$r = .01$	$r = .14$	P, S
Rasmussen and Boon (2018)	3-Scenarios and open question	Emotion management	NI	NI	NI	NI	NI	NI
Vander Molen et al. (2018)	4-Brief Dark Triad Scale	Dark Triad/Tetrad	$\alpha = .68 - .82$	$r_p = .18$	$r_p = .22$	$r_p = .10$	NI	N
Wissing and Reinhard (2018)	3-Scenarios and items	Risk perception of artificial intelligence	$\alpha = .84$ and .89	$r = .10$ and .26	$r = .03$ and .16	$r = .04$ and .19	NI	P, N, M
Appel et al. (2019)	3-Video clips and items	Emotional responses to eudaimonic narratives	$\alpha = .77$ and .97	$r = .09 - .18$	$r = 0 - .12$	$r = .08 - .09$	NI	P
Atkinson (2019)	1- Reading Span Task (RSPAN)	Working memory	NI	$r = .06$	$r = .14$	$r = .06$	NI	None
	1-Go/no-go task	Impulsivity	NI	$r = .07$	$r = .16$	$r = .01$	NI	None
	1-Task switching paradigm	Task-switching ability	NI	$r = .08$	$r = .06$	$r = .16$	NI	None
Bensch et al. (2019)	3-Vocabulary and Overclaiming Test (VOC-T) and questionnaire	Over-claiming bias	$\omega = .64$	$r = .05$	$r = .13$	$r = .08$	NI	N
Borráz-León et al. (2019)	5-Opensource ImageJ software version 1.42	Facial asymmetry	$r_{\text{intraclass}} = .95$	$r_p = .02$	$r_p = .28$	$r_p = .13$	NI	N
	5-Digital calliper	Finger length	$r_{\text{intraclass}} = .89$ and .90	$r_p = .11$ and .16	$r_p = .10$ and .22	$r_p = .12$	NI	N
Buckels et al. (2019)	3-Photographs and items	Perception of others' pain	$\alpha = .39$	$r = .23$	$r = .09$	$r = .14$	$r = .27$	P, M, S

Study	Indirect assessment			Results				Conclusion
	Instrument	Variable	Reliability	With P	With N	With M	With S	
	3-Photographs and items	Satisfaction for others' suffering	$\alpha = .68$	$r = .42$	$r = .13$	$r = .23$	$r = .46$	P, N, M, S
Chester et al. (2019)	2-Cyberball paradigm and Voodoo Doll Aggression Task (VDAT)	Aggressive behaviour	NI	$r = .06$	$r = .03$	$r = .03$	$r = .14$	S
	2-Taylor Aggression Paradigm (TAP)	Aggressive behaviour	$\alpha = .98$	$r = .14$	$r = .26$	$r = .14$	$r = .04$	P, N, M
Chung et al. (2019)	6(app data)-Social tracker application, built-in battery, and a form	Internet/social network uses	NI	$r = .03$ and .16	$r = .04$ and .05	$r = .06$ and .08	$r = .14$ and .17	None
	1-Go/no-go task	Impulsivity	NI	$r = .01$	$r = .01$	$r = .04$	$r = .11$	None
Clemente et al. (2019)	3-Scenarios and items	Unethical decision making	$\alpha = .93$	$r = .17$ and .22	$r = .11$ and .16	$r = .20$ and .23	NI	P, N, M
Dryden and Anderson (2019)	1-GNAT	Associative self-objectification	NI	$r = .02$	$r = .08$	$r = .01$	NI	None
	3-Photographic Figure Rating Scale (PRFS)	Body image concerns	NI	$r = .11$	$r = .15$	$r = .17$	NI	N, M
D'Souza et al. (2019)	2-Lottery and joint manipulation methods	Cheating behaviour	$r_{intraclass} = .44$	$r = .17$	$r = .11$	$r = .23$	NI	P, M
Duran et al. (2019)	3-Videos and items	Lie detection	NI	NI	NI	NI	NI	NI
Greitemeyer et al. (2019)	3-Video games trailers and items	Preference for violent videogames/movies	$\alpha > .87$	$r = .04 – .34$	$r = .01 – .19$	$r = 0 – .16$	$r = .02 – .34$	P, N, M, S
Hart et al. (2019)	3-Scenarios and items	Beneficial impression management	$\alpha = .94$ and .95	$r = .01 – .12$	$r = 0 – .14$	$r = .06 – .51$	NI	P, N, M
Jonason et al. (2019)	3-Scenarios and Defence Mechanisms Inventory	Emotion management	$\alpha = .60 – .90$	$r = .19$ and .43	$r = .21$	$r = .25$ and .50	NI	P, N, M
Josephs et al. (2019)	3-Scenarios and items	Preferences in social relations	$\alpha = .90$	$F = 7.11$	$F = 6.38$	NI	NI	P, N
Karandikar et al. (2019)	3-Greene's dilemmas	Utilitarian decision making	$r_{inter-rater} = .79$	$r = .27$ and .37	$r = .13$ and .22	$r = .18$ and .35	$r = .24$ and .34	P, N, M, S

Study	Indirect assessment			Results				Conclusion
	Instrument	Variable	Reliability	With P	With N	With M	With S	
Kaufman et al. (2019)	2-Conspicuous consumption-Extra money scale	Consumerist decision making	NI	NI	NI	NI	NI	NI
	3-Dilemmas and items	Utilitarian decision making	NI	NI	NI	NI	NI	NI
	2-Dictator game	Decision making with social value (sharing)	NI	NI	NI	NI	NI	NI
Moor et al. (2019)	1-GNAT	Negative attitudes towards gay men	RaSSH = .76 and .81	$r = .14$	$r = .01$	$r = .10$	$r = .03$	None
Pfattheicher et al. (2019)	2-Dice-rolling paradigm and watching eyes condition	Cheating behaviour	NI	NI	NI	NI	NI	NI
	2-Tossing a coin paradigm and watching eyes condition	Cheating behaviour	NI	NI	NI	NI	NI	NI
Prichard (2019)	5-EHI	Hand preference	NI	$\beta = 0.14$	$\beta = 0.01$	$\beta = .10$	NI	P
Ritchie et al. (2019)	3-Videos and Open-ended questions	Perception of nonverbal behaviour	$r_{intraclass} = .94$	$r = .02 - .26$	$r = .01 - .12$	$r = .01 - .21$	$r = .01 - .23$	P, M, S
Schimmenti et al. (2019)	1-RMET	Emotional recognition	$\alpha = .64$	$r = .19$	$r = .02$	$r = .09$	NI	P, M
Tetreault and Hoff (2019)	3-The Anagram task and items	Emotion management	NI	$\beta = 0.02$	$\beta = 0.05$	$\beta = 0.05$	NI	None
	3-The Anagram task and items	Ability to predict performance	NI	$\beta = 0.01$	$\beta = 0.02$	$\beta = 0.03$	NI	None
Tortoriello et al. (2019)	3-Scenarios and items	Interpersonally harmful behaviour	$r_{intraclass} = .39 - .68$	$\beta = 0.01 - 0.36$	$\beta = 0.02 - 0.10$	$\beta = 0.08 - 0.28$	$\beta = 0.01 - 0.42$	P, M, S
Wang et al. (2019)	3-Buddhist Patience Questionnaire (BPQ) with scenarios	Emotion management	$\alpha = .72 - .85$	$r = .37 - .51$	$r = .33 - .42$	$r = .23 - .42$	NI	P, N, M
Wertag and Bratko (2019)	6(survey)-Repeat a survey	Prosocial behaviour	NI	$r = .12$	$r = .17$	$r = .12$	NI	P, N, M

Study	Indirect assessment			Results				Conclusion
	Instrument	Variable	Reliability	With P	With N	With M	With S	
Bill et al. (2020)	3-Scenarios and items	Social desirability	α = .79 and .96	r = 0 and .05	r = .03 and .04	r = .02 and .04	NI	None
Breeden et al. (2020)	3-Scenario and items	Beneficial impression management	α = .93	r = .13	r = .06	r = .17	NI	P, M
Carré et al. (2020)	2-Opportunity Perception Task	Opportunistic decision making	NI	r = 0 and .03	r = .05	r = .06 and .09	NI	M
Clemente et al. (2020)	3-Scenarios and items	Unethical decision making	α = .92 – .95	β = 0.80 and 0.83	β = 0.57 and 0.48	β = 0.21 and 0.32	NI	P, N, M
Curtis and Jones (2020)	3-General Causality Orientations Scale (GCOS; with vignettes)	Motivation	α = .68 – .83	NI	NI	NI	NI	NI
Erzi (2020)	3-Scenarios and items	Satisfaction for others' suffering	α = .94 and .96	r = .23 and .34	r = .25 and .31	r = .34 and .35	NI	P, N, M
Fido et al. (2020)	1-IAT	Nature connectedness	NI	r = .11	r = .04	r = .20	r = .10	M
Hart et al. (2020)	3-Scenarios and items	Darkness tolerance - Darkness desirability	α = .27 – .94	r = .03 – .49	r = .01 – .15	r = 0 – .35	r = .08 – .57	P, N, M, S
Hart and Richardson (2020)	3-Scenarios and items	Darkness tolerance - Darkness desirability	α = .86 – .89	β = 0.28	β = 0.10	β = 0.21	NI	P, N, M
Jonason and Sherman (2020)	3-Situational diamonds (S8)	World perception	α = .65 – .91	r = 0 – .26	r = 0 – .20	r = 0 – .37	NI	P, N, M
Jonason et al. (2020)	2-Questions–ipsative options	Risky decision making	α = .91	r = .15	r = .17	r = .05	r = .12	P, N
Kajonius and Björkman (2020)	1-International Cognitive Ability Resource (ICAR16)	General Intelligence/ Convergent thinking	α = .74	r = .09	r = .19	r = .05	NI	N
	1-Multifaceted Empathy Test (MET)	Emotional recognition	α = .97	r = .05	r = .17	r = .09	NI	N
Kapoor and Khan (2020)	1-Divergent Thinking task	Divergent thinking/Creativity	$r_{intraclass} \geq$ .70	NI	β = 0.01 – 0.12	β = 0 – 0.15	NI	None
Kay and Saucier (2020)	3-97 trait adjectives	Moral normativity	r = .96 and .98	r = .18 – .35	r = .01 – .04	r = .01 – .28	NI	P, M
Koehn et al. (2020)	5-Questions and reverse cycle day method	Probability of conception	NI	NI	r = .25	NI	NI	N

Study	Indirect assessment			Results				Conclusion
	Instrument	Variable	Reliability	With P	With N	With M	With S	
Koscielska et al. (2020)	3-Scenarios and TOSS	Unethical decision making	α = .96 and .97	r = .33 – .43	r = .29 – .37	r = .21 – .35	r = .32 – .41	P, N, M, S
Kuzmicheva (2020)	2-Prisoner's dilemma	Decision making with social value (sharing)	NI	NI	NI	B = .01 – .02	NI	M
Malesza (2020)	2-Prisoner's dilemma	Decision making with social value (sharing)	NI	β = 0.50	β = 0.06	β = 0.34	NI	P, M
Malesza and Kaczmarek (2020)	4-SRP-III, NPI-17, MACH-IV	Dark Triad/Tetrad	α = .93 – .98	r = .46	r = .33	r = .49	NI	P, N, M
Michels et al. (2020)	1-Wechsler Adult Intelligence Scale (WAIS-IV)	General Intelligence/ Convergent thinking	NI	r = .09 – .34	r = .01 – .23	r = .01 – .14	NI	P
	2-Development of three stories	Ability/Attitude to lie	α = .62	r = .14	r = .09	r = .02	NI	None
Neumann et al. (2020)	3-Dilemmas and items	Utilitarian decision making	NI	NI	NI	NI	NI	NI
	2-Dictator game	Decision making with social value (sharing)	NI	NI	NI	NI	NI	NI
Nicholls et al. (2020)	1- Matrices-task	Cheating behaviour	NI	r = .37	r = .41	r = .39	NI	P, N, M
Nuzulia and Why (2020)	1-Raven's Advanced Progressive Matrices (APM)	General Intelligence/ Convergent thinking	NI	r = .02 and .07	r = .09	r = .01 and .11	NI	None
Sagioglou and Greitemeyer (2020)	3-Dip another person's hands in cold water	Antisocial decision making	NI	r = .28	r = .01	r = .23	r = .24	P, M, S
	3-Video clips	Preference for violent videogames/movies	NI	NI	NI	NI	NI	NI
	3-Dip hands in cold water and items	Masochistic behaviour	Spearman-Brown ρ = .87	r = .07	r = .10	r = .03	r = .05	None
	3-Tasting drinks and items	Bitter taste preferences	NI	r = .13	r = .07	r = .08	r = .10	P, S
Schmitt et al. (2020)	1-RMET	Emotional recognition	NI	r_p = .11 – .26	r_p = .07 – .16	r_p = .04 – .18	NI	P

Study	Indirect assessment			Results				Conclusion
	Instrument	Variable	Reliability	With P	With N	With M	With S	
Scott et al. (2020)	3-Twitter screenshots and items	Emotion understanding	α = .72 and .94	r = .10 – .25	r = .02 – .27	r = .10 – .15	NI	P, N, M
Sekścińska and Rudzinska-Wojciechowska (2020)	2-Investment risk propensity task	Risky decision making	NI	r = .18	r = .20	r = .07	NI	P, N, M
	2-Gambling risk-taking propensity task	Risky decision making	NI	B = 0.02 and 0.08	B = 0.08	B = 0.02 and 0.04	NI	P, N, M
Semrad and Scott-Parker (2020)	1-MSCEIT	Emotional intelligence	α = .72 – .95	NI	NI	NI	NI	NI
	2-DeceIT	Ability/Attitude to lie	NI	r = .03 and .06	r = .10	r = .05 and .08	NI	None
Sorokowski et al. (2020)	6(app data)-Online comment analysis	Networking language	NI	β = 1.37	β = 0.04	β = 0.08	NI	P
Van Doesum et al. (2020)	2-Social mindfulness paradigm (SoMi)	Prosociality	NI	r = .08	r = .23	r = .02	NI	N
Bernard et al. (2021)	2-Behavioral Body Inversion Paradigm (B-BIP)	Cognitive objectification of women's bodies	α = .72	r = .14	r = .10	r = .21	NI	P, N, M
Blagov (2021)	3-Public-health messages and items	Health behaviour endorsement	α = .93 – .95	r_p = 0.08 – 0.26	r_p = 0.04 – 0.12	r_p = 0.03 – 0.23	NI	P, N, M
Bolellí (2021)	2-A version of dictator game	Decision making with social value (sharing)	NI	β = 0.80	NI	NI	NI	P
Burtăverde and Ene (2021)	3-Scenario and attributes in Likert scale	Preferences in social relations	NI	r = .01 – .26	r = .01 – .32	r = .01 – .34	NI	P, N, M
	3-Scenario and preferences in Likert scale	Preferences in social relations	NI	r = .01 – .32	r = .07 – .40	r = .02 – .27	NI	P, N, M
Curtis et al. (2021)	2-The FlipIt game	Decision making for strategic resource control	NI	r = .01 – .11	r = .01 – .14	r = .03 – .10	NI	P, N, M
D'Agata et al. (2021)	3-Scenario and items	Self-disclosure to establish relations	NI	r = .04 – .22	r = .03 – .22	r = .03 – .21	NI	P, N, M

Study	Indirect assessment			Results				Conclusion
	Instrument	Variable	Reliability	With P	With N	With M	With S	
Dinić et al. (2021)	3-Bartels and Pizarro's dilemmas	Utilitarian decision making	NI	$r = .20 - .27$	$r = .17 - .21$	$r = .18 - .27$	$r = .20 - .28$	P, N, M, S
Doerfler et al. (2021)	2-Disease problem	Risky decision making	NI	$B = 1$	NI	NI	NI	P
Forsyth et al. (2021)	3-Scenarios and items	Ability/Attitude to lie	$\alpha = .54 - .79$	$r = .16 - .32$	$r = .08 - .39$	$r = .16 - .47$	$r = .19 - .42$	P, N, M, S
Geher et al. (2021)	3-Estrangement History and items	Social alignment	NI	$r = .20$	$r = .13$	$r = .15$	NI	P, N, M
	3-Scenarios and items	Social alignment	NI	$r = 0 - .34$	$r = .08 - .28$	$r = 0 - .30$	NI	P, N, M
Geng et al. (2021)	5-Blood collection tubes	White blood cell	NI	$r = 0.05$	$r = 0.15$	$r = 0.09$	NI	N
Gomes-Arrulo et al. (2021)	1-Arithmetic verification tasks	Cognitive performance	NI	NI	NI	NI	NI	NI
	1-Arithmetic verification tasks, stress-inducing paradigm, and items	Perceived stress	NI	NI	NI	NI	NI	NI
Greenwood et al. (2021)	3-Scenario and items from different scales	Affinity for morally ambiguous characters	$\alpha = .78 - .89$	$r = .19 - .40$	$r = .03 - .24$	$r = .24 - .33$	NI	P, N, M
Grover and Furnham (2021)	2-Lottery questions with scenario	Risky decision making	NI	NI	$r = .11$ and .31	$r = .18$ and .39	NI	N, M
	2-BART	Risky decision making	NI	NI	$r = .39$ and .54	$r = .42$ and .53	NI	N, M
Guo, Zhang, De Fruyt et al. (2021)	1-AUT	Divergent thinking/Creativity	$\alpha = .78 - .90$	$r = .06 - .07$	$r = .05 - .08$	$r = .03 - .06$	NI	None
Guo, Zhang and Pang (2021)	1-AUT	Divergent thinking/Creativity	$\alpha = .78$	$r = .07$	$r = .08$	$r = .03$	NI	None
Kapoor et al. (2021)	3-Scenarios and items	Unethical decision making	$\alpha = .89 - .96$	$\beta = 0.03 - 0.35$	$\beta = 0.04 - 0.45$	$\beta = 0.22 - 0.30$	NI	P, N, M
Koschmieder and Neubauer (2021)	3-Emotion Regulation in Pedagogical Situations (ERIPS)	Emotional regulation	$r_{intraclass} = .79$	$r = .22 - .31$	$r = .18 - .24$	$r = .20 - .26$	NI	P, N, M

Study	Indirect assessment			Results				Conclusion
	Instrument	Variable	Reliability	With P	With N	With M	With S	
	3-Situational Test of Emotional Understanding (STEU)	Emotion understanding	NI	$r = .01$	$r = .04$	$r = .16$	NI	M
	3-Situational Test of Emotion Management (STEM)	Emotion management	NI	$r = .30$	$r = .23$	$r = .16$	NI	P, N, M
Kückelhaus et al. (2021)	1-Diagnostic Analysis of Nonverbal Accuracy (DANVA2)	Emotional recognition	$\alpha = .75$	NI	NI	$r = .15$	NI	M
Laakasuo et al. (2021)	3-Greene's dilemmas	Utilitarian decision making	$\alpha = .85$	$r = .23$	$r = .09$	$r = .26$	NI	P, N, M
	3-Scenarios and items	Mind upload acceptance	$\alpha = .91$	$r = .15$	$r = .01$	$r = .18$	NI	P, M
Lämmle et al. (2021)	4-Self-Report Psychopathy Scale-III (SRP-III), Narcissistic Personality Inventory (NPI-40), Machiavellianism test IV (MACH-IV)	Dark Triad/Tetrad	$\alpha = .44 - .86$	$r = .37 - .59$	$r = .41 - .72$	$r = .12 - .30$	NI	P, N, M
Lämmle and Ziegler (2021)	1-Operation Span Task (AOSPAN)	Working memory	NI	$r = .06$	$r = .15$	$r = .01$	NI	None
	1-AOSPAN and White-noise paradigm	Self-harming behaviour	NI	$\beta = 0.18$	$\beta = 0.17$	$\beta = 0.04$	NI	None
	2-Lightning Reaction Reloaded	Self-harming behaviour	NI	$r = .25$ and .26	$r = .06$ and .08	$r = .25$ and .29	NI	P, M
Mahmud et al. (2021)	6(machine-learning)-Random Forest, Support Vector Machine, and Naïve Bayes algorithms	Dark Triad/Tetrad	NI	Accuracy ≈ 0.65	Accuracy ≈ 0.59	Accuracy ≈ 0.91	NI	M
Malesza and Kalinowski (2021a)	2-Delay-discounting task	Risky decision making	NI	$r = .44$	$r = .34$	$r = 0$	NI	P, N

Study	Indirect assessment			Results				Conclusion
	Instrument	Variable	Reliability	With P	With N	With M	With S	
Malesza and Kalinowski (2021b)	2-Delay-discounting task	Risky decision making	NI	$r = .52$	$r = .46$	$r = .09$	NI	P, N
	2-Social-discounting task	Decision making with social value (sharing)	NI	$r = .57$	$r = .42$	$r = .39$	NI	P, N, M
Markowitz and Levine (2021)	1-Matrices-task	Cheating behaviour	NI	$r = .15 - .58$	$r = .05 - .06$	$r = .08 - .16$	NI	None
Nai and Maier (2021)	3-Scenarios and items	Political attitudes	$\alpha = .88$ and .90	$r^2 = .01 - .36$	$r^2 = .01 - .29$	$r^2 = .01 - .25$	NI	P, N
	3-Scenarios and items	Political attitudes	$\alpha = .95$	$r^2 = 0 - .39$	$r^2 = .05 - .25$	$r^2 = .02 - .31$	NI	P, N, M
Ok et al. (2021)	3-Shoes photos and items	Unethical decision making	NI	NI	NI	NI	NI	NI
	3-Scenarios and items	Unethical decision making	$\alpha = .46$ and .89	$r = .26$ and .40	r = .16 and .30	$r = .21$ and .33	NI	P, N, M
Puthillam, Karandikar, and Kapoor (2021)	1-Geneva Emotion Recognition Test-Short Version (GERT-S)	Emotional recognition	NI	$r = .11$ and .16	$r = .23$	$r = .12$	NI	P, N
Puthillam, Karandikar, Kapoor and Parekh (2021)	3-Scenarios and items	Gratitude state	$\alpha = .73$	$r = 0$ and .07	$r = .08$ and .12	$r = .02$ and .03	NI	N
Quan et al. (2021)	5-Chelex-100 method	Genotyping - BDNF Val66Met)	NI	$\beta = 0 - 0.04$	$\beta = 0.03 - 0.12$	$\beta = 0.06 - 0.11$	NI	N, M
Vaughan and Madigan (2021)	1-Basketball free-throw task	Sport performance	NI	$r = .11$ and .13	$r = .13$ and .16	$r = .10$ and .12	NI	P, N, M
Wilkinson and Dunlop (2021)	3-Quantifying narrative themes	Understanding and assuming responsibility	$\alpha = .86$ and .91	$r = .03$ and .24	$r = .02$ and .17	$r = .01$ and .15	NI	P
Zirenko et al. (2021)	3-Verbal tasks-scenarios with items	Mask-wearing decision making	NI	$B = 0.11 - .22$	$B = 0.07 - .21$	NI	NI	P, N
Hart et al. (2022)	3-Antagonism-confirmation task	Antagonistic personality	$\alpha = .77$	$r = .03 - .84$	$r = .01 - .81$	$r = .01 - .75$	$r = .02 - .85$	P, N, M, S

Study	Indirect assessment			Results				Conclusion
	Instrument	Variable	Reliability	With P	With N	With M	With S	
Yuan et al. (2022)	6(machine-learning)-LIWC software	Network language	NI	$r = 0 – .21$	$r = .04 – .19$	$r = .05 – .24$	NI	P, N, M

Note. The numbers appearing in the Variable column indicate to which category the variable belongs, where 1 = OPTs masked as achievement tasks, 2 = OPTs that aim to represent real-life simulations, 3 = Questionnaire-type OPTs that ask for evaluations or decisions, 4 = Objective measure in peer-report format, 5 = Objective measure in biomedical data format, 6 = Other; P = psychopathy; N = narcissism; M = Machiavellianism; S = sadism; NI = Not indicated; α = Cronbach's alpha; ω = McDonald's Omega; r = Pearson correlation; r_p = Partial correlation; r^2 = determination coefficient; B = Unstandardized regression coefficient; β = Standardized regression coefficient; F = two-variance coefficient; WRMR = Weighted Root Mean Square Residual; RaSSH = Random Sample of Split Halves; RF model = Random Forest model; γ = Gamma estimator. When an instrument measures more than two variables, we have indicated the range of values (X - X). In the conclusion's column, the Dark Tetrad traits that are associated with the variable indicated in each study are indicated.

assess the Dark Triad, while 10.07 % (*n* = 27) focused on assessing the Dark Tetrad. These measures were further classified into the six groups proposed in this doctoral thesis: 21.56 % (*n* = 58) fell into the category of OPTs masked as achievement tasks, 23.05 % (*n* = 62) were categorized as OPTs that aim to represent real-life simulations, 39.41 % (*n* = 106) were categorized as Questionnaire-type OPTs that ask for evaluations or decisions, 3.36 % (*n* = 9) were classified as objective measures in observer-report format, 7.81 % (*n* = 21) were objective measures in biomedical data format, and 4.46 % (*n* = 12) were classified in the "other" category. Concerning the variables assessed by these objective measures (which, therefore, indirectly assessed the dark traits), 121 different variables were identified (Table 6.2).

Regarding the reliability of the measures, not all studies provided statistical indices to support their adequate usage. Among the studies that did report reliability statistics (125 out of 268 measures, i.e., 46.64 %), the majority reported α values. O them, while a few measures had α values lower than .60, most reached at least .70. However, as α is not applicable to all objective instruments (e.g., game-based tasks), some studies reported other reliability measures such as Intra-class or Intra-assay Correlation Coefficients.

In terms of the results obtained, most studies reported correlation coefficients, but some also presented regression analysis results (e.g., standardized and unstandardized beta coefficients) and other estimators (e.g., two-variance coefficient or Gamma estimator). However, a subset of studies (*n* = 38; 14.55 %) did not provide any data indicating the possible relationship between objectively measured variables and Dark Triad and Dark Tetrad traits.

Among the studies that did draw conclusions regarding the relationship (*n* = 230; 85.82 %), 15.65 % (*n* = 36) found the relationship with any of the traits to be nonsignificant, suggesting that the instruments used in these studies may not reliably measure dark traits indirectly. In contrast, of the studies reporting significant relationships (84.35 %; *n* = 194), 4.78 % (*n* = 11) identified significant relationships with all four Dark Tetrad traits, 38.70 % (*n* = 89) identified relationships with all three Dark Triad traits, and 40.87 % (*n* = 94) found relationships with one, two, or three of the traits (in cases where the three traits did not form the Dark Triad).

Finally, the three Dark Triad traits were significantly related to a similar number of variables measured by objective measures (out of n = 194). Psychopathy showed significant relationships with 154 variables (79.38 %), narcissism with 139 variables (71.65 %), and Machiavellianism with 144 variables (74.23 %).

Table 6.2

Categories of the instruments for indirect assessment of Dark Triad and Dark Tetrad traits and measured variables

Categories	Variables
(1) OPTs masked as achievement tasks	General intelligence/convergent thinking and divergent thinking/creativity, over-claiming bias, verbal ability, auditory skills, working memory, harmful and self-harming behaviour, emotional intelligence, emotional recognition, risky decision making, cheating behaviour, productive and counterproductive effects of recognition, racial prejudice, implicit branding, or negative attitudes toward gay men, associative self-objectification, impulsivity, task-switching ability, nature connectedness, cognitive performance, perceived stress, and sport performance.
(2) OPTs that aim to represent real-life simulations	Risky, opportunistic, social value (sharing), strategic control, and consumerist decision making, cheating behaviour, lie detection and ability/attitude to lie, preferences in social relations, cooperative attitude, sadistic task choice, self-harming behaviour, theft decision making, ability to negotiate, aggressive behaviour, emotional recognition, prosociality, and cognitive objectification of women's bodies.
(3) Questionnaire-type OPTs that ask for evaluations or decisions	Racial, violent, and political attitudes, cheating behaviour, interpersonal assessment of vulnerability in others, utilitarian, unethical, antisocial, fraudulent, mask-wearing, opportunistic, and situational judgmental decision making, perception, connection and satisfaction for others' suffering and pain, sexual tactics, unethical behaviour, moral normativity, interpersonally harmful behaviour, emotional intelligence, emotion management, adequacy and understanding, emotional regulation, empathy, political, social relations and violent videogames/movies preferences, social desirability, beneficial impression management, conditional reasoning for aggression, exhibitionism in social networks, Internet/social network uses, person-organization fit, minimization of intent and responsibility, bribe-taking intention, belief in good luck, negative mate retention tactics, online trolling behaviours, social comparation, lie detection, ability/attitude to lie, revenge porn proclivity, aggressive driving behaviours, trust in company after data breach, gossip recognition memory, risky perception of artificial intelligence, emotional responses to eudaimonic narratives, over-

	claiming bias, body image concerns, perception of nonverbal behaviour, ability to predict performance, motivation, darkness tolerance – darkness desirability, world perception, masochist behaviour, bitter taste preferences, health behaviour endorsement, self-disclosure to establish relations, social alignment, affinity for morally ambiguous characters, mind upload acceptance, gratitude state, understanding and assuming responsibility, and antagonistic personality.
(4) Objective measure in peer-report format	Dark Triad and Dark Tetrad traits by through of an informant (such as family members or friends).
(5) Objective measure in biomedical data format	Testosterone, cortisol, hand preference, probability of conception, reproductive health problems, amount of pain, number of miscarriages, cycle length, waist-to-hip and facial width-to-height ratio, facial asymmetry, finger length, white blood cell, and genotyping.
(6) "Other"	Networking language, mimicry behaviour, exhibitionism in social networks, Internet/social network uses, prosocial behaviour, and the Dark Triad and Dark Tetrad traits with machine-learning.

Study 7, objective 7. Observer-reports as a complement to self-reports in the assessment of Dark Triad: a meta-analysis

Version 1

Selection and inclusion of studies

Figure 7.1 illustrated the comprehensive process of searching, screening, and excluding studies to arrive at the final number of studies included in the first version of the meta-analysis ($N = 7$ with 8 effect sizes). Initially, a total of 8537 studies were retrieved by implementing the search equation in the databases. Among these, 3315 studies were identified as duplicates and consequently removed, leaving 5222 studies for further evaluation. In the first screening phase, a significant portion of the studies was excluded as they were not relevant to the topic of interest, meaning they included terms such as "triad," "tetrad," or "dark," but did not pertain to the Dark Triad or Dark Tetrad traits. Exclusion reason 10, related to studies that did not utilize an observer-report to assess the dark traits, could not be applied in this stage as it was often unclear whether most studies incorporated observer-reports, making it uniquely relevant to the second screening phase. During the second screening phase, 854 studies were excluded primarily due to the absence of observer-reports together with self-report assessments of the traits. This step ensured that only those studies employing both types of reports were considered for the final analysis.

Initially, it was anticipated that nine studies would satisfy the inclusion criteria; however, upon conducting the data extraction phase, it became evident that two out of the nine studies needed to be excluded. The reason for their exclusion was that, although these studies did employ observer-reports, the samples used in these studies overlapped with another study. Essentially, the same sample had been utilized for three different studies, and each of these studies reported different sets of data, including correlations either divided by sex or not reporting the relevant correlations of interest. To avoid redundancy in the sample and potential bias in the outcomes, the two studies that did not provide the values of interest were omitted, and only the study that did provide the relevant data was retained for analysis (Holtzman, 2011; Holtzman & Strube, 2013a, 2013b).

Quality assessment of studies

The methodological quality assessment of the chosen studies demonstrated that none of the studies received an excellent rating, but none were deemed poor either. Two studies

were classified as good, while the remaining five studies were considered fair. Most of the studies lacked comprehensive information concerning their research methodology, particularly in terms of the sampling strategy and statistical approaches utilized. However, despite these variations in quality, the values of interest were not influenced by the methodological quality of the studies.

Characteristics of the included studies

General information

Table 7.1 provides an overview of the characteristics of the seven studies that met the specified inclusion criteria. However, it is important to note that one of these studies presented data from two distinct samples (parents and friends as independent informants), treating them as separate studies for the purpose of our analyses (Lämmle et al., 2021). Consequently, the analysis of self-report accuracy was conducted based on seven studies with eight effect sizes.

These studies were published between 2013 and 2021, with two studies adopting this assessment methodology in 2013. It is noteworthy that none of the included studies assessed the Dark Tetrad, meaning that sadism was not part of the assessment. Instead, all seven studies focused on assessing narcissism, Machiavellianism, and psychopathy, forming the Dark Triad, so the results presented in the following sections will refer to the Dark Triad.

Description of the sample

The combined sample size across all included studies, which encompassed participants evaluated by both self-report and observer-report, amounted to 2023 individuals (mean sample size = 252.88; range = 65-798). In terms of participant characteristics, the mean age across these samples was 19.86, and the average proportion of women was 62.39 %. Most participants were of German nationality (n = 1367; 67.57 %), and a significant portion were students (n = 1389; 68.66 %).

Description of self-reports and observer-reports scales

Regarding the assessment scales utilized to measure the dark traits, both self-reports and observer-reports have been reported. Specifically, six distinct types of scales, some of which were versioned, were used for self-report measures. These included the Self-Report Psychopathy Scale (SRP; Paulhus et al., in press), the Narcissistic Personality Inventory

Table 7.1

Information about the articles included in the analyses

Study	Sample					Instruments			Results (*r*)				S. score
	Country	Size (*N*)	Sample age (*M*; *SD*)	Gender proportion (female)	Sample type	Self-report (α)	Observer-report (α)	Informant	P	N	M	S	
Holtzman and Strube (2013b)	United States	151	19.40; 1.22	56%	Students	SRP-III (.92); NPI-40 (.85); Mach-IV (.81)	*Ad hoc* (.39); *Ad hoc* (.78); *Ad hoc* (-.04)	Friends, acquaintance from college, hometown or high school, current and ex-intimate partner	.33	.48	.26	NI	71.43
Muris et al. (2013)	Netherlands	117	13.90; 0.96	56.41%	Students	DD-Y (.67); DD-Y (.66); DD-Y (.70);	DD-Y (.71); DD-Y (.74); DD-Y (.76);	Parents	.23	.15	.32	NI	58.93
Jones and Paulhus (2014)	United States and Canada	65	20.10; NI	60%	Mturk	SD3 (.80); SD3 (.71); SD3 (.77)	SD3 (.86); SD3 (.67); SD3 (.62)	Friends, family, romantic partners	.57	.34	.42	NI	62.50
Miller et al. (2017)	NI	178	19.30; 2.20	63.92%	Students	SRP-III (.93); NPI (.82); Mach-IV (.81)	SD3 + DD (NI); SD3 + DD (NI); SD3 + DD (NI);	NI	.29	.17	.33	NI	51.97
Vander Molen et al. (2018)	United States	145	20.37; 2.88	82.75%	Students	SD3 + Brief DT (.80); SD3 + Brief DT (.76); SD3 + Brief DT (.80);	Brief DT (.68); Brief DT (.82); Brief DT (.75);	Other people on Facebook	.09	.18	.12	NI	64.29
Malesza and Kaczmarek (2020)	Germany	798	22.90; 1.30	68%	Students	SRP-III (.79); NPI-17 (.77); Mach-IV (.83)	SRP-III (.98); NPI-17 (.93); Mach-IV (.97)	Acquaintance, roommate, or significant other	.46	.33	.49	NI	64.29

Study	Sample					Instruments			Results (*r*)				S. score
	Country	Size (*N*)	Sample age (*M*; *SD*)	Gender proportion (female)	Sample type	Self-report (α)	Observer-report (α)	Informant	P	N	M	S	
Lämmle et al. (2021)	Germany	279	21.44; 1.81	56%	General population	SRP-III (.73-.77); NPI (.77-.85); Mach-IV (.43-.55)	SRP-III (.76-.79); NPI (.75-.81); Mach-IV (.44-.69)	Parents	.43*	.63*	.26*	NI	80.36
	Germany	290	21.44; 1.81	56%	General population	SRP-III (.73-.77); NPI (.77-.85); Mach-IV (.43-.55)	SRP-III (.80-.84); NPI (.84-.86); Mach-IV (.45-.63)	Friends	.53*	.70*	.28*	NI	

Note. P = Psychopathy; N = Narcissism; M = Machiavellianism; S = Sadism; S. score = STROBE score; NI = Not indicated; α = Cronbach's alpha; *r* = Pearson's correlation; Mturk = Amazon's Mechanical Turk; SD3 = Short Dark Triad; DD = Dirty Dozen; DD-Y = Dirty Dozen for Youths; SRP-III = Self-Report Psychopathy Scale–III version; NPI = Narcissistic Personality Inventory; Brief DT = Brief Dark Triad Scale; *By Fisher *Z*-transformation.

NPI; Raskin & Hall, 1979), the Machiavellianism Scale (Mach-IV; Christie & Geis, 1970), the Short Dark Triad (SD3; Jones & Paulhus, 2014), the Dirty Dozen (DD; Jonason & Webster, 2010), and a combination of the SD3 with a brief Dark Triad measure. The internal consistency estimates (α) for these self-report instruments ranged from .43 to .93. As for observer-reports, the same scales were used in each study, but the items were modified to refer to third-person observations. However, two studies deviated from this pattern: one developed their own *ad hoc* scale, and the other combined the SD3 with the DD. In the case of observer-reports, the internal consistency estimates ranged from -.04 to .98.

The informants (i.e., participants who would fill out the dark trait scales with the targets in mind) included various groups such as family members, friends, acquaintances from high school, college, or hometown, roommates, and ex-partners or current romantic partners. Notably, in one study, informants were individuals not personally known to the targets; rather, they were other people from Facebook. Additionally, one of the studies did not provide specific information regarding the type of informants used.

Accuracy of observer-reports: Effect sizes

Accuracy of observer-report to assess narcissism

The analysis of Narcissism, assessed through both self-report and observer-report, revealed a medium-sized positive correlation (r = .42, 95 % CI [0.23, 0.61], z = 4.31, p < .001; Figure 7.3) based on the random-effects model (k = 8). This indicates a significant positive relationship between narcissism as measured by both methodologies. However, considerable heterogeneity was observed between samples, as indicated by the Q test and I2 statistics (Q (7) = 117.85, p < .001, I^2 = 93.97), with a τ^2 value of 0.070 (95 % CR [-0.13, 0.97]).

Accuracy of observer-report to assess Machiavellianism

The analysis of Machiavellianism, assessed through both self-report and observer-report, using the random-effects model (k = 8), showed a positive correlation of medium magnitude (r = .33, 95 % CI [0.23, 0.42], z = 6.79, p < .001; Figure 7.4). This indicates a significant positive relationship between Machiavellianism as measured by both self-report and observer-report. The Q test and I^2 statistics also demonstrated significant heterogeneity between samples (Q (7) = 37.65, p < .001, I^2 = 74.16), and τ^2 was 0.013 (95 % CR [0.09, 0.57]).

Figure 7.3

Forest plot of the relationship between narcissism assessed with self-report and assessed with observer-report
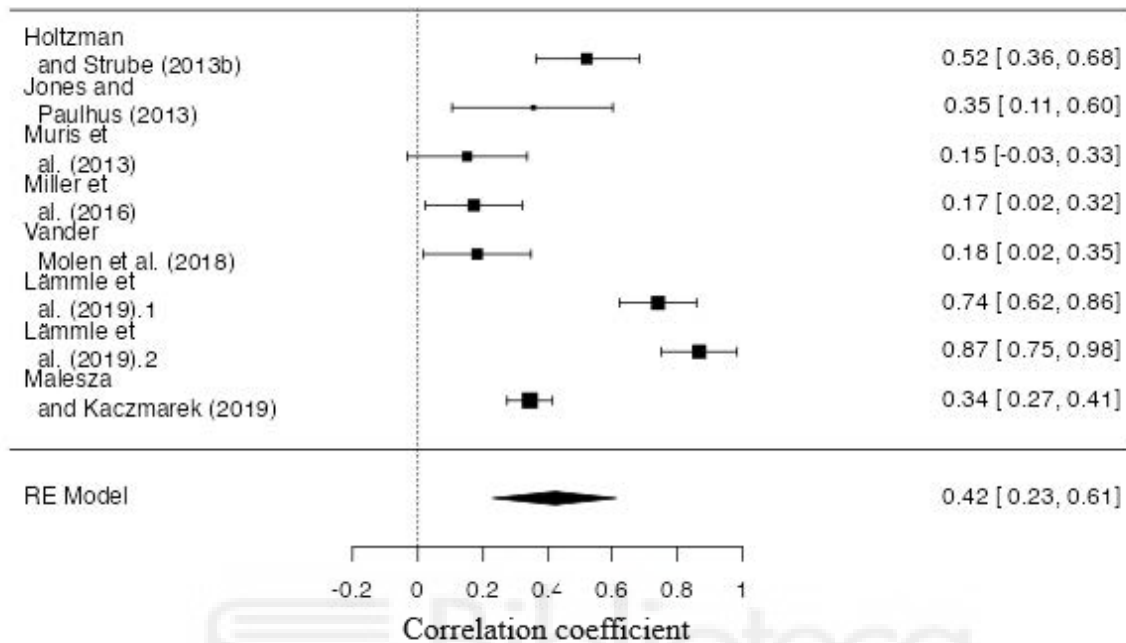
Accuracy of observer-report to assess psychopathy

Finally, psychopathy ($k = 8$) also showed a positive correlation of medium magnitude ($r = .40$, 95 % CI [0.27, 0.52], $z = 6.25$, $p < .001$; Figure 7.5). This indicates a significant positive relationship between psychopathy as measured by both self-report and observer-report. The Q test and I^2 statistics revealed significant heterogeneity between samples (Q (7) = 38.94, $p < .001$, $I^2 = 85.21$), and τ^2 was 0.026 (95 % CR [0.06, 0.73]).

Publication bias assessment

Possible publication bias was assessed using two methods: Begg and Mazumdar's rank correlation test and Egger's regression test. The results of the Begg and Mazumdar rank correlation test showed no significant correlation for narcissism (correlation coefficient = 0, p-value = 1), Machiavellianism (correlation coefficient = 0, p-value = 1), and psychopathy (correlation coefficient = -0.43, p-value = 0.18). Similarly, the results of Egger's regression test indicated no significant bias for narcissism (regression coefficient = -0.94, p-value = 0.35), Machiavellianism (regression coefficient = -0.82, p-value = 0.41), and psychopathy

(regression coefficient = -0.36, *p*-value = 0.72). These findings suggest that there was no evidence of publication bias in any of the analysed cases.

Figure 7.4

Forest plot of the relationship between Machiavellianism assessed with self-report and assessed with observer-report
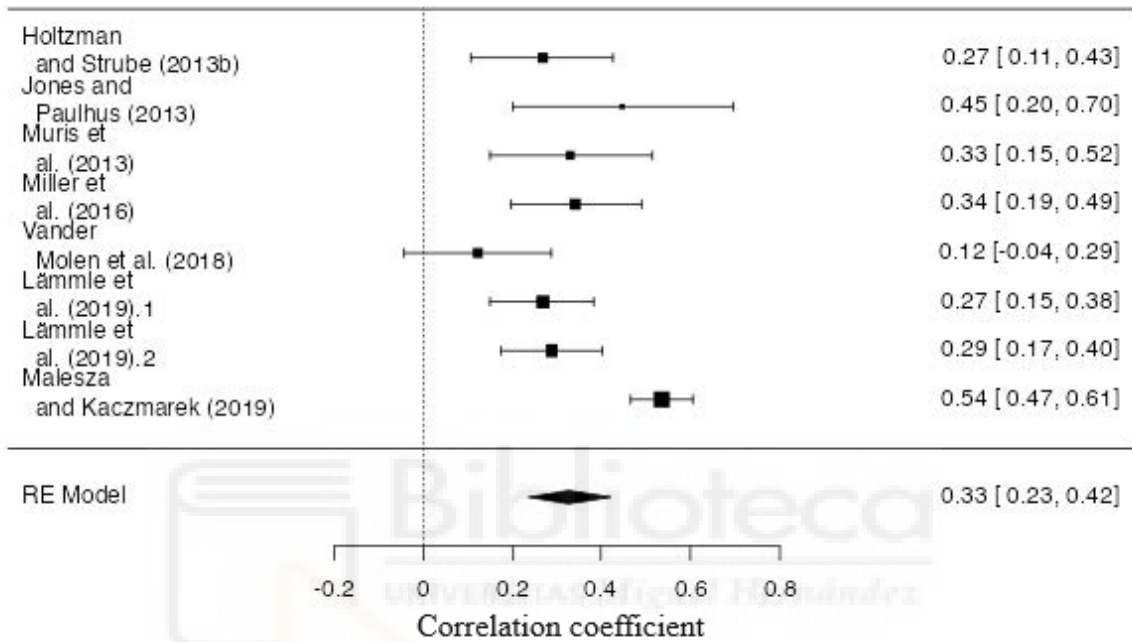
Version 2

Selection and inclusion of studies

Figure 7.2 showed the search process, screening, and exclusion of studies for the second version of the meta-analysis (*N* = 13 with 17 effect sizes). This second version had only one different inclusion criterion compared to the first version (criterion number 6 of the first version). Consequently, the initial steps yielded the same results, where a total of 8537 studies were retrieved from various databases, 3315 duplicates were eliminated, and 5222 studies were left for screening.

Like the first version, in the first screening a significant number of studies were excluded due to their lack of relevance to the topic of interest. Although some studies mentioned terms such as "triad," "tetrad," or "dark," they did not pertain to the Dark Triad or the Dark Tetrad. Furthermore, during the second screening, most exclusions (*n* = 1362)

were attributed to the absence of observer-reports as a complementary measure for the assessment of self-reported traits.

Figure 7.5

Forest plot of the relationship between psychopathy assessed with self-report and assessed with observer-report
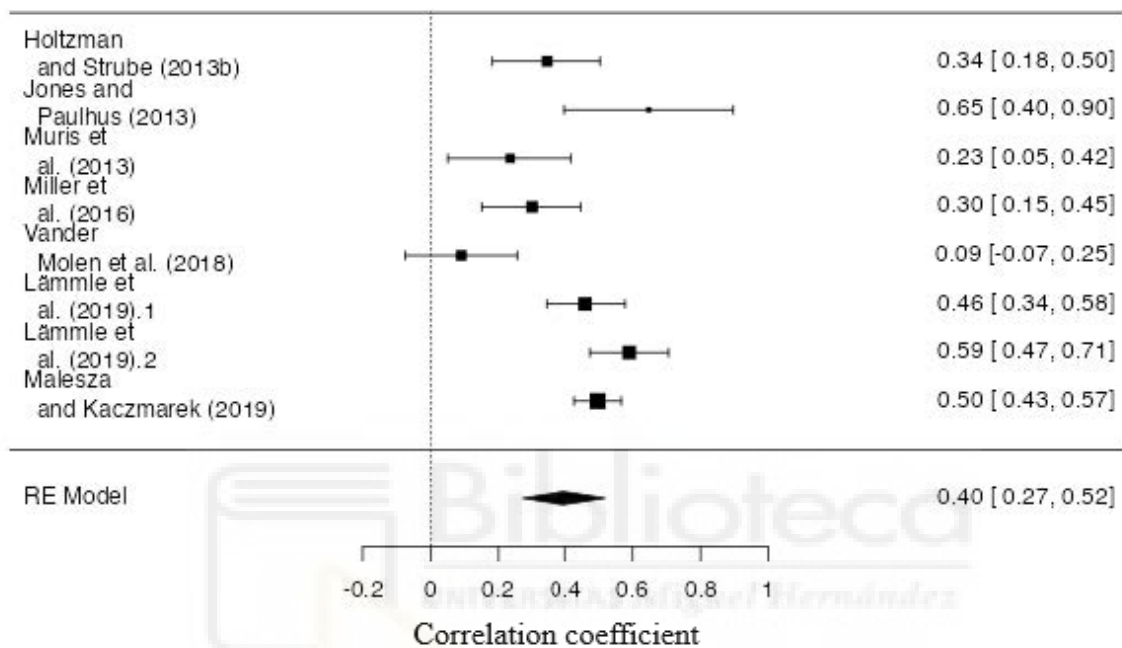
Quality assessment of studies

The assessment of methodological quality indicated that none of the studies received an excellent rating, but at the same time, none were considered poor. Four studies were rated as good, while nine studies were classified as fair. Like the first version, most of the studies lacked comprehensive information concerning their research methodology.

Characteristics of the included studies

General information

Table 7.2 provides an overview of the characteristics of the 13 studies that met the predefined inclusion criteria. Among these, four studies reported multiple samples due to variations in informant type, gender-specific analyses, or the use of multiple observer-reporting instruments. Consequently, these studies were treated as separate entities in the analyses (He et al., 2018; Lämmle et al., 2021; Maaß & Ziegler, 2017; Weiss et al., 2018),

Table 7.2

Information about the articles included in the analyses

Study	Sample					Instruments			Results (*r*)				S. score
	Country	Size (*N*)	Sample age (*M*; *SD*)	Gender proportion (female)	Sample type	Self-report (α)	Observer-report (α)	Informant	P	N	M	S	
Holtzman and Strube (2013b)	United States	151	19.40; 1.22	56%	Students	SRP-III (.92); NPI-40 (.85); Mach-IV (.81)	*Ad hoc* (.39); *Ad hoc* (.78); *Ad hoc* (-.04)	Friends, acquaintance from college, hometown or high school, current and ex-intimate partner	.33	.48	.26	NI	71.43
Muris et al. (2013)	Netherlands	117	13.90; 0.96	56.41%	Students	DD-Y (.67); DD-Y (.66); DD-Y (.70);	DD-Y (.71); DD-Y (.74); DD-Y (.76);	Parents	.23	.15	.32	NI	58.93
Jones and Paulhus (2014)	United States and Canada	65	20.10; NI	60%	Mturk	SD3 (.80); SD3 (.71); SD3 (.77)	SD3 (.86); SD3 (.67); SD3 (.62)	Friends, family, romantic partners	.57	.34	.42	NI	62.50
Nealis et al. (2016)	NI	588	20.70; 3	76.77%	Students	DD (.78)	DD (.89)	Friends, family, romantic partners, other	—	.38	—	—	80.36
Maaß and Ziegler (2017)	Germany	219	37.52; 16.93	64.38%	General population	SD3 (.70)	NPI-16 (NI)	Trained research assistants	—	.32	—	—	64.29
	Germany	219	37.52; 16.93	64.38%	General population	SD3 (.70)	Communal Narcissism Inventory (NI)	Trained research assistants	—	-.05	—	—	
Miller et al. (2017)	NI	178	19.30; 2.20	63.92%	Students	SRP-III (.93); NPI (.82); Mach-IV (.81)	SD3 + DD (NI); SD3 + DD (NI); SD3 + DD (NI);	NI	.29	.17	.33	NI	51.97
He et al. (2018)	China	260	28.28; 3.84	100%	General population	LSRP (NI); Mach-IV (NI)	LSRP (NI); Mach-IV (NI)	Romantic partners	.36	—	.34	—	62.50

Study	Sample					Instruments			Results (*r*)				S. score
	Country	Size (*N*)	Sample age (*M*; *SD*)	Gender proportion (female)	Sample type	Self-report (α)	Observer-report (α)	Informant	P	N	M	S	
	China	260	26.61; 3.96	0%	General population	LSRP (NI); Mach-IV (NI)	LSRP (NI); Mach-IV (NI)	Romantic partners	.41	—	.26	—	
Klipfel and Kosson (2018)	NI	62	26.40; 6.70	0%	Inmates	NPI (.85)	IM-N (.94)	Trained research assistants	—	.29	—	—	71.43
Vander Molen et al. (2018)	United States	145	20.37; 2.88	82.75%	Students	SD3 + Brief DT (.80); SD3 + Brief DT (.76); SD3 + Brief DT (.80);	Brief DT (.68); Brief DT (.82); Brief DT (.75);	Other people on Facebook	.09	.18	.12	NI	64.29
Weiss et al. (2018)	United States	172	26; 3.40	100%	General population	NEO-FFI *ad hoc* version (.73)	NEO-FFI *ad hoc* version (.75)	Romantic partners	.41	—	—	—	62.50
	United States	172	27.60; 3.90	0%	General population	NEO-FFI *ad hoc* version (.70)	NEO-FFI *ad hoc* version (.79)	Romantic partners	.46	—	—	—	
Heinze et al. (2020)	Germany	527	27.68; 9.84	81.48%	General population	NPI	NPI	Friends, family	—	.57	—	—	66.07
Malesza and Kaczmarek (2020)	Germany	798	22.90; 1.30	68%	Students	SRP-III (.79); NPI-17 (.77); Mach-IV (.83)	SRP-III (.98); NPI-17 (.93); Mach-IV (.97)	Acquaintance, roommate, or significant other	.46	.33	.49	NI	64.29
Lämmle et al. (2021)	Germany	279	21.44; 1.81	56%	General population	SRP-III (.73-.77); NPI (.77-.85); Mach-IV (.43-.55)	SRP-III (.76-.79); NPI (.75-.81); Mach-IV (.44-.69)	Parents	.43*	.63*	.26*	NI	80.36
	Germany	290	21.44; 1.81	56%	General population	SRP-III (.73-.77); NPI (.77-.85); Mach-IV (.43-.55)	SRP-III (.80-.84); NPI (.84-.86); Mach-IV (.45-.63)	Friends	.53*	.70*	.28*	NI	

Note. P = Psychopathy; N = Narcissism; M = Machiavellianism; S = Sadism; NI = Not indicated; S. score = STROBE score; α = Cronbach's alpha; *r* = Pearson's correlation; Mturk = Amazon's Mechanical Turk; SD3 = Short Dark Triad; DD = Dirty Dozen; DD-Y = Dirty Dozen for Youths; SRP-III = Self-Report Psychopathy Scale–III version; LSRP = Levenson Self-Report Psychopathy Scale; NPI = Narcissistic Personality Inventory; IM-N = Interpersonal Measure of Narcissism; Brief DT = Brief Dark Triad Scale; NEO-FFI = NEO Five-Factor Inventory; *By Fisher *Z*-transformation.

resulting in a total of 13 studies with 17 effect sizes for the examination of observer-report accuracy. It is important to note that some studies only measured one of the three traits, leading to different effect sizes depending on the specific trait assessed.

The selected studies spanned publication years from 2013 to 2021, with a greater concentration of studies adopting this assessment methodology in 2013. None of the studies included in the analysis evaluated the Dark Tetrad, meaning that sadism assessment was absent. Like the first version, all 13 studies focused on assessing the traits of the Dark Triad (narcissism, Machiavellianism, and psychopathy).

Description of the sample

The combined sample across all studies amounted to 4502 participants, with an average sample size of 264.82 individuals ranging from 62 to 798. The mean age of the participants across the studies was 24.54, and the average proportion of female participants was 58.01 %. Most of the participants were of German origin, comprising 51.80 % of the total sample, and a substantial portion (53.27 %) were drawn from the general population.

Description of self-reports and observer-reports scales

Regarding self-reports, a total of eight distinct scales were employed, some of which underwent modifications. These scales were the same as those mentioned in the first version, with the addition of the Levenson Self-Report Psychopathy Scale (LSRP; Levenson et al., 1995) and an *ad hoc* version of the NEO Five-Factor Inventory (NEO-FFI; Costa & McCrae, 1992). The internal consistency (α) of these measurement instruments varied from .43 to .93. As for observer-reports, the same scales were utilized across all studies, but adjusted to the third-person perspective. However, four studies employed different scales, including an *ad hoc* scale, a combination of the SD3 and DD, the NPI and the Communal Narcissism Inventory, and the Interpersonal Measure of Narcissism (IM-N; unpublished measure). In this case, the α ranged from -.04 to .98.

The participants acting as informants in this second version were consistent with those in the first version. They included family members, friends, acquaintances from high school, university, or hometown, roommates, and former or current romantic partners. Additionally, two of the studies in this second version involved trained research assistants as informants.

Accuracy of observer-reports and the moderating role of the type of informant: Effect sizes

Accuracy of observer-report to assess narcissism

The random-effects model (k = 13) revealed a medium-sized positive correlation (r = .39, 95 % CI [0.24, 0.53], z = 5.30, p < .001; Figure 7.6) between narcissism assessed through both self-reports and observer-reports. The Q test and I^2 statistics indicated substantial heterogeneity among the samples (Q (12) = 196.81, p < .001, I^2 = 94.31), and the estimated τ^2 was 0.063 (95 % CR [-0.13, 0.90]).

Figure 7.6

Forest plot of the relationship between narcissism assessed with self-report and assessed with observer-report
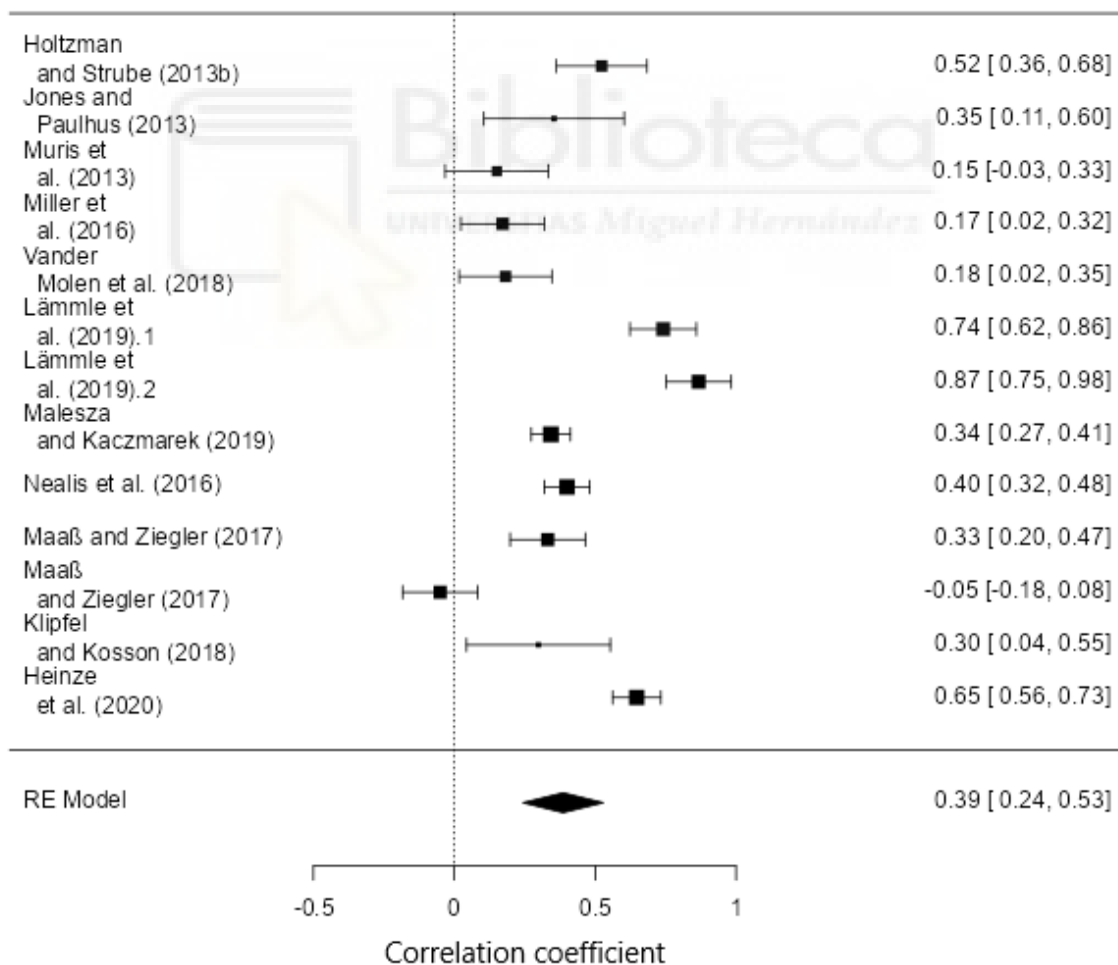
Incorporating informant type as a moderator in the analysis, the random-effects model ($k = 12$) demonstrated a medium-sized negative correlation ($r = -.33$, 95 % CI [-0.60, -0.06], $p < .05$). This finding indicates that informant type significantly moderates the relationship between the two assessment methodologies, with a stronger association observed when the informant is personally acquainted with the target individual.

Accuracy of observer-report to assess Machiavellianism

The random-effects model ($k = 10$) also showed a positive correlation of medium magnitude ($r = .33$, 95 % CI [0.25, 0.40], $z = 8.35$, $p < .001$; Figure 7.7), indicating a positive association between this trait when assessed through both methodologies. Significant heterogeneity was observed between the samples ($Q (9) = 40.77$, $p < .001$, $I^2 = 69.85$), with τ^2 estimated at 0.010 (95 % CR [0.12, 0.53]).

Upon inclusion of informant type as a moderator in the analysis ($k = 9$), the correlation was no longer significant ($r = -.23$, 95 % CI [-0.49, 0.03], $p > .05$). This outcome suggests that the informant type did not demonstrate a detectable influence on the effect size, indicating that the choice of informant did not significantly affect the relationship between the two assessment methodologies.

Accuracy of observer-report to assess psychopathy

Finally, the random-effects model ($k = 12$) also demonstrated a positive correlation of medium magnitude for this trait ($r = .41$, 95 % CI [0.33, 0.49], $z = 10.10$, $p < .001$; Figure 7.8). Significant heterogeneity was observed between the samples ($Q (11) = 40.48$, $p < .001$, $I^2 = 76.19$), and τ^2 was estimated at 0.014 (95 % CR [0.16, 0.66]).

When including informant type as a moderator in the analysis ($k = 11$), a negative correlation of medium magnitude was found ($r = -.36$, 95 % CI [-0.58, -0.15], $p < .001$). These results indicated that the choice of informant significantly moderates the relationship between the two assessment methodologies, and this relationship was stronger when the informant was personally acquainted with the individual being assessed.

Publication bias assessment

The results of the Begg and Mazumdar rank correlation test indicated the following: for narcissism, a correlation coefficient of -0.14, with a *p*-value of 0.50; for Machiavellianism, a correlation of 0, with a *p*-value of 1; and for psychopathy, a correlation of -0.43, with a *p*-

value of 0.05. Meanwhile, the Egger's regression test yielded the following results: for narcissism, a regression coefficient of -1.09, with a *p*-value of 0.28; for Machiavellianism, a coefficient of -1.02, with a *p*-value of 0.31; and for psychopathy, a coefficient of -0.61, with a *p*-value of 0.54. These findings suggest that there was no significant evidence of publication bias in any of the cases analysed. However, it is worth noting that for psychopathy, the p-value was close to 0.05, which might indicate some bias.

Figure 7.7

Forest plot of the relationship between Machiavellianism assessed with self-report and assessed with observer-report
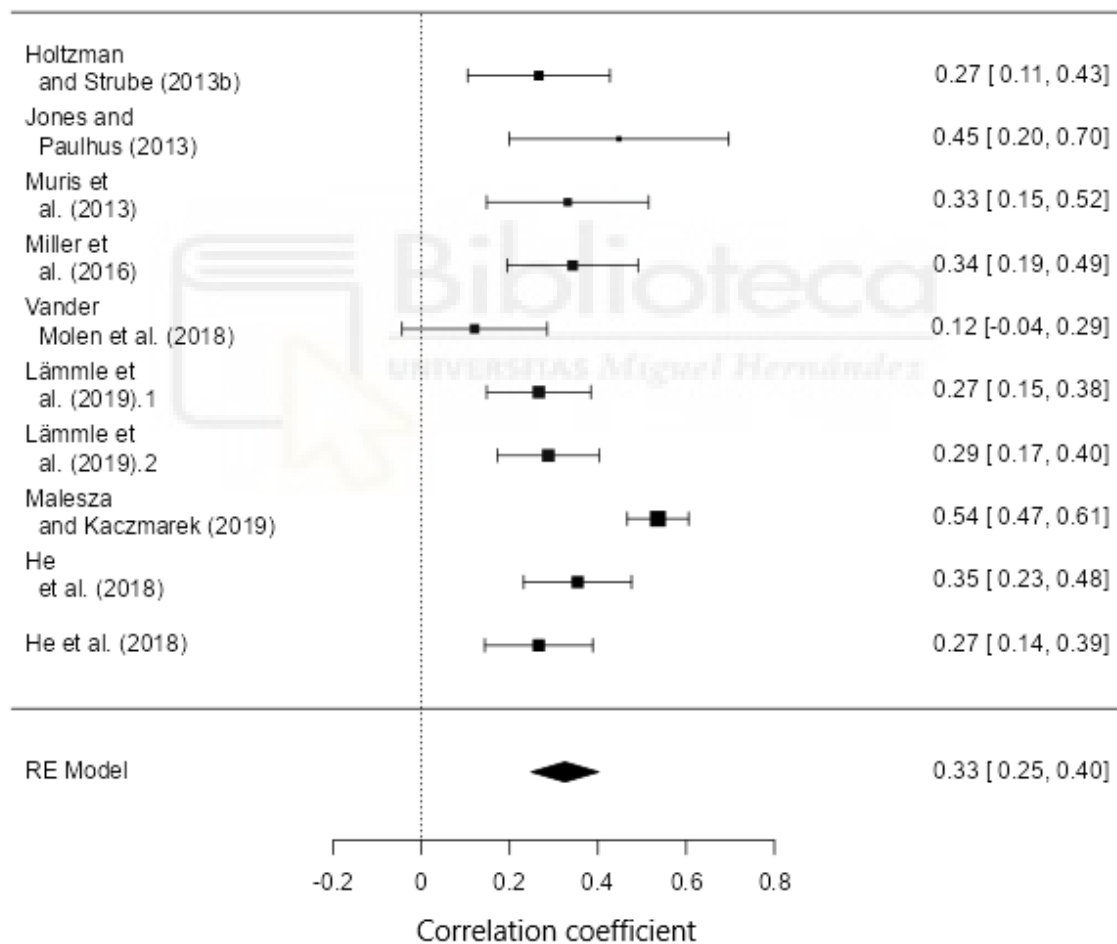
Figure 7.8

Forest plot of the relationship between psychopathy assessed with self-report and assessed with observer-report
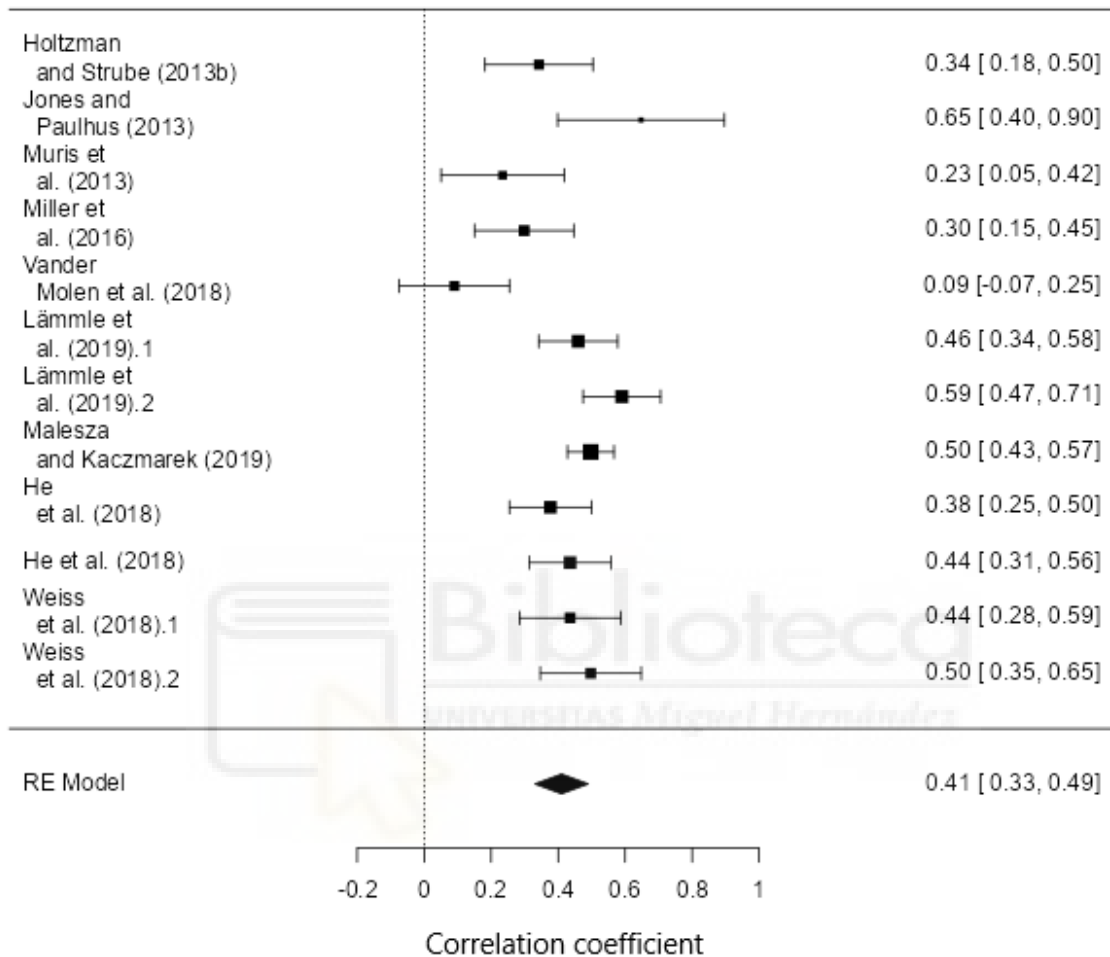
DISCUSSION

The aim of this doctoral thesis has been to deepen our knowledge of the traits of the Dark Triad and the Dark Tetrad (how they relate to other personality models and other variables of scientific interest) to conclude with the main interest of this work: how to improve their assessment using instruments that complement self-report. To this end, seven work objectives were set, the results of which are discussed below.

Study 1, objective 1. Are the dark personalities sincere? Connections between the Dark Triad and the Big Three

The objective of this study was to analyse the relationships between the dark personality model of the Dark Triad described by Paulhus and Williams (2002) (narcissism, Machiavellianism, and psychopathy) and the PEN model of the general personality described by Eysenck and Eysenck (1975) (psychoticism, extraversion, and neuroticism). In addition, including the relationship with sincerity, a variable included in this second model. All this in a sample of Spaniards.

While the PEN model does not fully capture the variance of the Dark Triad, it has revealed associations with its assessed traits. Machiavellianism showed its strongest connection with neuroticism, which aligns with findings by Mohammadzadeh and Ashouri (2018), suggesting that anhedonic and alexithymic moods, common among individuals scoring high on Machiavellianism and neuroticism, may explain this relationship (Cale, 2006; Fehr et al., 1992). H1 was partially rejected since relationships with psychoticism were also expected (Mohammadzadeh & Ashouri, 2018).

As expected, high scores on narcissism were related to high scores on neuroticism (H2 was supported), likely due to similarities in personality tendencies such as heightened sensitivity to criticism or low frustration tolerance (Curtis & Jones, 2020; Pineda et al., 2020). Additionally, in line with Mohammadzadeh and Ashouri (2018), extraversion was also related to narcissism, possibly stemming from the desire of individuals with high narcissism scores to showcase their superiority and the need for acceptance, sometimes even engaging in prosocial behaviour to achieve this (Cale, 2006; Raskin & Hall, 1981; Trahair et al., 2022).

Psychopathy, as predicted, was linked to high scores in psychoticism, which was expected given the conceptual overlap between these constructs (Mohammadzadeh & Ashouri, 2018; Pineda et al., 2020). These relationships, while not implying a perfect

correlation, feed into the ongoing debate about their shared nature (Kajonius et al., 2016). Hence, H3 was partially supported given that the relationships with the other two dark traits were not significant (Mohammadzadeh & Ashouri, 2018). Furthermore, although the associations may be faint or lacking statistical significance, the slight inclination of individuals with higher psychopathy scores to exhibit introversion and emotional stability can be attributed to their challenges in socializing. These difficulties stem from their lack of interest and capacity to comprehend and empathize with others' emotions, coupled with their typically low levels of anxiety (Hare, 1999).

Another interesting finding of this study is the inclination of Dark Triad personalities to provide sincere responses, indicating low social desirability (H4 was supported). Partially aligned with Kowalski et al. (2018), the results of this study suggest that individuals with high Dark Triad scores do not place significant importance on projecting a favourable image, being willing to engage in behaviours that may sometimes be considered socially undesirable. However, these findings differ from those obtained by Kowalski et al. (2018) regarding narcissism, as results of this study showed an inverse association between social desirability and narcissism (as with the other two dark traits), and they in their study obtained a positive relationship. This discrepancy, along with the direct association between the other two Dark Triad traits and the sincerity scale, may be attributed to the nature of the items used in the sincerity scale. The items are designed to assess acceptance of antisocial tendencies believed to be present in most individuals, thereby sharing similarities with the items of the Dark Triad (e.g., "have you ever taken advantage of another person?" "Have you ever wanted to help yourself more than to share with others?").

These findings do not contradict the deceptive nature often associated with the Dark Triad (Baughman et al., 2014). It is possible that respondents in this study did not perceive any benefit in modifying their responses, although in situations where such benefits exist, individuals with high Dark Triad scores may distort their questionnaire responses. Interestingly, Machiavellianism exhibits the strongest association with the sincerity scale, even though it is characteristically associated with manipulative strategies, such as adapting responses to questionnaires based on the context (Fehr et al., 1992). In forensic assessment contexts, individuals with high Dark Triad scores may be more inclined to bias their assessments and present themselves as more socially desirable (Echeburúa et al., 2011; Spaans et al., 2017).

Study 2, objective 2. Civic engagement and personality: Associations with the Big Five and the Dark Triad

The objective of this study was to analyse the relationship between the Dark Triad traits and civic engagement, delving into the difference between this relationship when general personality traits (i.e., the Big Five) are also included in the model and when they are not. In other words, to analyse the relationship between personality traits and civic engagement, delving into the specific contribution of the Dark Triad and controlling for the association with the Big Five in a sample of young Spaniards.

On the one hand, results revealed no significant association between the sociodemographic variable of gender and civic engagement, contrary to findings from previous studies (Dinesen et al., 2014; Ha, 2019; Pruysers et al., 2019). This discrepancy could be attributed to sample differences in terms of culture and age, as the average age in the present study was lower than in previous studies (20.51 versus 50). However, Doolittle and Faul (2013) argued that there is no theoretical basis to support the notion that age and gender influence civic attitudes.

Regarding the Dark Triad, civic engagement displayed a positive association with narcissism and a negative association with Machiavellianism and psychopathy, when only the Dark Triad traits were included in the model. Hence, H1 was only partially supported since significant associations were expected only with narcissism (positive) and psychopathy (negative), while a non-significant association was anticipated with Machiavellianism.

These findings differ from those obtained in the only localized study that analysed these associations using a regression model, which did not find an association with Machiavellianism (Pruysers et al., 2019). In that study authors suggest that considering the motivations and interests of individuals in engaging with their community may offer insights into this discrepancy. The different measurement approaches used to assess civic engagement could explain the disparity in results. These authors also emphasized the importance of interpreting the results within the cultural context.

In relation to the Big Five traits, the most notable association with civic engagement was found for openness to experience, surpassing agreeableness, and conscientiousness, with no association observed for extraversion and neuroticism. Hence, H2 is also only

partially supported as significant associations were expected for all five traits (positive associations for all except neuroticism).

These results diverge from previous literature as no study has reported identical associations with the same traits (Dinesen et al., 2014; Ha, 2019; Habashi et al., 2016; Omoto et al., 2010; Pruysers et al., 2019; Weinschenk, 2014). However, several studies have established positive associations with openness to experience, agreeableness, and conscientiousness (e.g., Dinesen et al., 2014; Weinschenk, 2014). Similarly, some studies have not found associations with neuroticism (Weinschenk, 2014), although all the cited articles have reported relationships with extraversion.

The associations between civic engagement and the Big Five traits were controlled for the association with the Dark Triad, which may account for the disparity in results compared to previous studies (Weinschenk, 2017). Additionally, significant correlations were observed between civic engagement and the five traits, aligning with previous literature (Dinesen et al., 2014). It should be acknowledged that each study examines civic engagement to varying depths, ranging from general commitment to the community to specific behaviours such as voting, rule-following, and participation in associations, among others. The level of specificity could have influenced (Dinesen et al., 2014; Ha, 2019; Habashi et al., 2016; Omoto et al., 2010; Pruysers et al., 2019; Weinschenk, 2014). In our case, the questions were more general, which could prompt participants to respond in broad terms, acknowledging their engagement with the community through certain behaviours but not others. Hence, our results may be somewhat general in nature.

On the other hand, results support H3, as expected differences in the magnitude of association with civic engagement were observed when malevolent traits were examined in isolation compared to when they were considered alongside more general traits. The combined contribution of all traits (Dark Triad and Big Five) yielded a stronger association with civic engagement. When the Big Five traits were included in the model, the association with Machiavellianism and psychopathy became non-significant, leaving narcissism as the only trait significantly and positively associated with civic engagement. The association with the three Dark Triad traits was stronger when assessed independently of the Big Five. These results cannot be directly compared to previous literature since this is the first study to analyse the association between civic engagement and personality traits, encompassing both

general and dark traits, within the same regression model. The association between certain traits may explain the differences observed in this study (Weinschenk, 2017).

Notably, the association between civic engagement and narcissism, distinct from the other two dark traits, suggests that individuals with narcissistic traits do engage with their community. There are different possible explanations for this fact. For example, these results may be explained by the associations between different traits, such as those observed with general personality traits (Weinschenk, 2017). Additionally, the relationship between narcissism and general traits aligns with previous literature, including positive associations with extraversion, openness to experience, and conscientiousness, and negative associations with neuroticism and agreeableness (e.g., Balakrishnan et al., 2019; Koehn et al., 2019; Naor-Ziv et al., 2022; Szabó et al., 2023). These findings are consistent with those reported by Van Groningen et al. (2021), who proposed that general traits may confer narcissism with a protective factor status in relation to the other traits of the Dark Triad.

Another possible explanation, as suggested by Pruysers et al. (2019), is that individuals with narcissistic traits may engage in good deeds to seek praise and admiration from others, thereby exhibiting desirable characteristics mentioned earlier (Nagler et al., 2014; Szabó & Bereczkei, 2017; Veselka et al., 2012). Furthermore, it is well-known that individuals with narcissistic traits constantly seek to enhance their self-esteem and ego (Alexander et al., 2010; De Holanda Coelho et al., 2021; Feddes et al., 2015; Paulhus & Williams, 2002); and a positive relationship has been observed between having high collective self-esteem and community engagement (Santa-Bárbara, 1999). Hence, these individuals may engage in benevolent actions without necessarily being excessively sympathetic or generous towards others, which could explain the negative relationship observed in this study, as well as in previous literature (although null in some studies), between narcissism and agreeableness (Koehn et al., 2019; Naor-Ziv et al., 2022; Vedel & Thomsen, 2017).

Study 3, objective 3. The connection between Dark Triad and Emotional Intelligence traits: A multi-study person-centred approach

The objective of this study was to identify latent profiles based on Dark Triad traits and EI factors in a sample of Spanish young adults using LPA. Once the profiles were obtained, the aim was also to analyse the differences between them based on two types of variables of interest for the study: those proposed as possible influences on the positive relationship between narcissism and EI (i.e., self-esteem, prosocial behaviours and low levels of personal distress); and those that have empirically demonstrated both their positive relationship with narcissism and EI (well-being, civic engagement and psychological strengths) and their negative relationship (psychological difficulties-psychopathology).

Previous literature has shown (through observational-correlational analyses) negative relationships between IE and Machiavellianism and psychopathy, but it has shown inconsistent results regarding the relationship with narcissism, making it unclear whether it is positive or negative (Hjalmarsson & Dåderman, 2020; Hyde et al., 2020; Miao et al., 2019; Michels & Schulze, 2021; Nagler et al., 2014; Plouffe et al., 2017; Schreyer et al., 2023; Szabó & Bereczkei, 2017; Walker et al., 2021; Zhang et al., 2015). Based on it, it was expected to uncover three profiles: one characterized by high Dark Triad traits and low EI, another with low Dark Triad traits and high EI, and a third with low Machiavellianism and psychopathy traits, high narcissism, and high EI.

However, although the LPA revealed a model of three profiles, the characteristics of each of them were different from those expected. The first profile exhibited low scores on both Dark Triad traits and EI, which was not aligned with the H1. The second profile showed low scores on Machiavellianism and psychopathy, medium scores on narcissism, and high scores on EI, partially supporting the H1. Finally, the third profile displayed high scores on Dark Triad traits and low scores on EI, supporting the H1. However, our data did not support the presence of a profile with low scores on the Dark Triad traits but high EI, contrary to findings from previous metanalytic/systematic reviews (Miao et al., 2017; Walker et al., 2021).

The findings of those studies indicate that individuals with high scores on the dark traits are likely to have lower levels of EI. They propose that individuals with higher EI are less likely to exhibit these undesirable personality traits, as there is a negative association

with Machiavellianism and psychopathy, and a non-significant association with narcissism. Regarding the profiles obtained in this study, when considering the values of the dark traits, the primary difference between the first and second profiles lies in the level of narcissism, whereas notable variations across all factors of EI are observed.

Therefore, this study using a person-centred methodology (LPA) provides additional evidence supporting the existence of a profile with individuals who possess both narcissistic traits and high EI, as demonstrated by positive correlations between these variables (negative correlations with Machiavellianism and psychopathy) (Hjalmarsson & Dåderman, 2020; Hyde et al., 2020; Nagler et al., 2014; Petrides et al., 2011; Plouffe et al., 2017; Schreyer et al., 2023; Szabó & Bereczkei, 2017; Zhang et al., 2015). It is important to note that the profile with the lowest level of narcissistic traits corresponds to the lowest level of EI (Profile 1). Our results showed that individuals with similar low scores in Machiavellianism and psychopathy exhibit parallel patterns of medium-high narcissism and EI (Profile 2), whereas low narcissism aligns with low EI (Profile 1).

These findings align with previous research suggesting that individuals with high scores in all three traits of the Dark Triad tend to have lower EI, challenging the notion of a "dark EI" phenomenon (Miao et al., 2017; Michels & Schulze, 2021; Walker et al., 2021). However, the role of the narcissistic trait appears to be significant, potentially indicating the presence of an EI influenced by narcissistic traits (Hjalmarsson & Dåderman, 2020; Hyde et al., 2020; Nagler et al., 2014; Van Groningen et al., 2021).

Regarding the second objective of this study, it was expected that the profile characterized by low Machiavellianism and psychopathy, medium-high narcissism, and high EI (Profile 2) would demonstrate higher mean scores on positive variables (well-being, civic engagement, and psychological strengths) and lower scores on negative variables (psychological difficulties-psychopathology). Consistent with previous research that has analysed the relationships between these variables individually (Nagler et al., 2014; Szabó & Bereczkei, 2017; Veselka et al., 2012), results confirmed these expectations (H2).

Previous studies have suggested various explanations for the positive relationship between narcissism and EI, such as the need for narcissistic individuals to maintain their grandiose self-perception, display prosocial behaviours, possess optimism, likability, high self-esteem, and low personal distress (Nagler et al., 2014; Szabó & Bereczkei, 2017;

Veselka et al., 2012). Accordingly, in this study, individuals with low Machiavellianism and psychopathy, medium-high narcissism, and high EI (Profile 2) demonstrated higher self-esteem, engaged in prosocial behaviours, and exhibited lower levels of personal distress. Furthermore, this people displayed higher levels of well-being, greater community engagement, and fewer psychological difficulties, which align with previous findings and contribute to the existing knowledge in this field (Papageorgiou et al., 2019, 2020; Pruysers et al., 2019; Stead et al., 2012; Womick et al., 2020).

Study 4, objective 4. Unveiling the depths of Tinder: Decoding the Dark Tetrad and sociosexuality in motives behind online dating

The objective of this study was to identify profiles of individuals in terms of their dark traits (i.e., Dark Tetrad) and their orientation towards unrestricted sex (i.e., sociosexual orientation) in a sample of Spaniards. As a second and main objective, to analyse the differences between the profiles found based on the different reasons for using Tinder. Although it was not a primary objective of this doctoral thesis, a scale was also validated to measure the motives for using Tinder given the lack of scales validated in the Spanish population for this purpose.

Firstly, this study successfully developed a shortened version of the original TMS called the TMS-SF, which was validated for the Spanish population (H1 was supported). Specifically, the scale maintained the 13 different reasons for using Tinder but eliminated 19 items. Interestingly, the full version of the scale, consisting of 58 items, did not fit well with the Spanish sample, which made it possible to reduce the scale and, in turn, improve the fit of the factor structure. Given the widespread usage and popularity of dating apps, particularly Tinder, it is crucial to understand the various motivations behind people's use of these apps and how they engage with others through them (Anzani et al., 2018; Duguay, 2017; Sumter et al., 2017). Having valid and reliable instruments for measurement is essential in achieving this goal.

Consistent with previous research, the findings indicate that Tinder users do not solely use the application for the purpose of seeking romantic relationships or casual sexual encounters (Phan et al., 2021; Sumter et al., 2017; Sumter & Vandenbosch, 2019; Timmermans & De Caluwé, 2017; Wu & Trottier, 2022). The participants in this study displayed motivations aligned with the 13 reasons for use included in the TMS-SF (H2 was supported) (Timmermans & De Caluwé, 2017). Many individuals use the app for other motives, such as socializing, entertainment, or out of simple curiosity. Examining the diverse reasons for app usage can contribute to a better understanding of behaviours and outcomes associated with Tinder use, as well as shed light on the characteristics of individuals who engage with these apps (Timmermans & De Caluwé, 2017). Ultimately, comprehending how and why people utilize these apps is crucial for anticipating and comprehending the potential consequences of their usage (Castro & Barrada, 2020).

Secondly, building upon the notion that dark personality traits and sociosexual orientation may influence motivations for using dating apps like Tinder (Lyons et al., 2022; Sevi, 2019; Sumter & Vandenbosch, 2019; Timmermans et al., 2018), the current study aimed to identify profiles of individuals based on Dark Tetrad traits and unrestricted sexuality, and examine the differences in Tinder usage motives among these profiles. However, contrary to expectations, the LPA did not support a two-profile model, but a three-profile model (rejecting H3). Although this study is the first to explore profiles based on these variables, consistent with previous research indicating positive associations between these constructs, we did identify a profile characterized by low scores on both the Dark Tetrad traits and sociosexual orientation (the Non-dark and non-sociosexual profile). However, we did not find a profile that exhibited high scores on both constructs, indicating an absence of an opposite classification (Burtaverde, 2021; Lechuga & Jones, 2021; Malesza & Kaczmarek, 2021; Sevi, 2019).

Contrary to expectations, we identified a profile that demonstrated average scores on the Dark Tetrad traits, with a slight elevation in narcissism and a slight decrease in sadism, while displaying the highest scores on sociosexual orientation (the Slightly narcissistic and sociosexual profile). Interestingly, individuals with a less restrictive sociosexual orientation, who engage in a larger number of casual sexual relationships with different partners for shorter durations, do not appear to exhibit a greater presence of dark traits, although they do seem to be slightly narcissistic. Previous studies have found that psychopathy exhibits the strongest association with sociosexuality, followed by Machiavellianism (Burtaverde, 2021; Lechuga & Jones, 2021; Malesza & Kaczmarek, 2021; Sevi, 2019). However, in a study conducted by Lechuga and Jones (2021), where women rated the attractiveness of men on Tinder based on Dark Triad traits, it was found that narcissistic men were perceived as more attractive by women with higher sociosexuality (with an association specifically between the narcissistic profile and sociosexuality). Similarly, in our study, the highest scores were observed for the narcissistic trait, which exhibited the strongest correlations with sociosexuality.

In addition, we identified another unexpected profile characterized by the highest scores in the Dark Tetrad, particularly in the traits of psychopathy and sadism, but with average scores in sociosexual orientation, albeit slightly elevated in sociosexual behaviour (the High-dark and slightly sociosexual profile) (Burtaverde, 2021; Lechuga & Jones, 2021;

Malesza & Kaczmarek, 2021; Sevi, 2019). Interestingly, individuals with higher levels of narcissism, Machiavellianism, psychopathy, and sadism traits do not appear to have the least restrictive sociosexual orientation.

Previous investigations have indicated that Tinder users tend to exhibit higher levels of dark traits compared to non-users (Freyth & Batinic, 2021; Sevi, 2019). However, our findings showed the existence of a subgroup of Tinder users who exhibit low scores on both dark traits and sociosexuality. Interestingly, this profile represents the largest proportion of study participants (41.30 %). Consistent with our hypotheses, this profile appears to have the least motivation to use Tinder for sexual encounters, seeking social approval, distraction, and entertainment purposes (supporting H4). In line with previous research, it was anticipated that individuals with high scores on the Dark Tetrad would prioritize sexual motives when using Tinder, while the pursuit of romantic relationships was not expected to be a prominent factor (Freyth & Batinic, 2021; Lyons et al., 2022; Timmermans et al., 2018). Although the differences between profiles regarding the search for a romantic relationship variable did not reach statistical significance, it is worth noting that this profile exhibited the highest mean score. Thus, it appears that the primary motivation for Tinder use among these individuals remains the search for a romantic relationship.

Among the remaining two profiles, the Slightly narcissistic and sociosexual profile exhibited the highest scores on unrestricted sexual orientation. This suggests that although previous research has indicated the relevance of both dark personality and sociosexuality in motivating the use of Tinder for sexual purposes (e.g., Sevi, 2019), sociosexuality appears to be a more influential factor in shaping these motives for app usage in this study. Individuals in this profile showed greater motivation to use Tinder for engaging in casual sexual encounters with various partners. On the other hand, the High-dark and slightly sociosexual profile appeared to be more motivated to use the app for social approval, following trends, reducing social pressure, enhancing social skills, and seeking distraction, entertainment, and coping with the end of a previous relationship. Lyons et al. (2022) found in their study that Machiavellianism was the Dark Tetrad trait that predicted these motives.

Previous research has consistently indicated that individuals with Dark Tetrad traits tend to use Tinder primarily for motives related to sexuality, social approval, distraction, and entertainment (Freyth & Batinic, 2021; Lyons et al., 2022; Timmermans et al., 2018). Our findings align with these previous studies, as the High-dark and slightly sociosexual profile

displayed the highest average scores for these motives, except for sexual motives. Once again, in this study, it appears that dark personality traits played a more significant role in driving these specific motives for app usage.

This study also revealed that being male may serve as a determining factor for classification within the High-dark and slightly sociosexual profile, indicating that males are more likely to belong to this group compared to the Non-dark and non-sociosexual profile. The OR did not contribute to distinguishing between the Slightly narcissistic and sociosexual profile and the High-dark and slightly sociosexual profile, where differences in scores on Dark Tetrad traits and sociosexuality were observed. These findings are consistent with previous research indicating that men generally tend to score higher on Dark Tetrad traits (Chabrol et al., 2009; Muris et al., 2017). In line with these results, Sevi et al. (2019) investigated the potential moderating effect of gender on differences in Dark Triad traits and sociosexuality between Tinder users and non-users and found no significant effect.

This study employed a novel methodology to identify distinct groups of individuals based on their scores across multiple scales concurrently (Williams & Kibowski, 2015). As a result, the findings of this study have yielded an interesting classification into three profiles that were contrary to expectations (i.e., one profile characterized by low scores on the Dark Tetrad and sociosexuality, and another profile characterized by high scores on both constructs). The identification of these profiles has provided a different distribution of participants and their respective motivations when using the Tinder application.

Specifically, it was observed that individuals with lower levels of dark traits and sociosexual orientation showed the least motivation to use Tinder for purposes other than finding a romantic partner; individuals with slightly elevated scores on dark traits and high scores on sociosexual orientation exhibited the highest motivation to use Tinder for sexual purposes; and individuals with the highest scores on dark traits and slightly elevated scores on sociosexual orientation were found to be motivated to use Tinder for various utilitarian purposes, including gaining social approval, improving social and flirting skills, reducing social pressure, staying trendy, seeking entertainment, and getting over an ex-partner. Therefore, the study revealed that individuals with moderate scores on the Dark Tetrad traits, rather than those with the highest scores, appeared to be most interested in using Tinder for sexual purposes. These findings align with the conceptualization of Dark Tetrad traits, particularly their common underlying aspect of insensitive manipulation. Furthermore,

previous research has indicated that individuals with these personality traits often exhibit unstable and volatile relationships, leading them to actively seek sporadic romantic and sexual encounters (e.g., Jonason et al., 2013). Thus, these motives can prove to be highly relevant and informative in the context of Tinder usage (Paulhus, 2014; Paulhus & Williams, 2002).

Study 5, objective 5. The Dirty Twenty: A brief Spanish measure for assessing the Dark Tetrad of personality

The objective of this study was to validate a brief but valid and reliable measure to assess the Dark Tetrad traits of personality (i.e., narcissism, Machiavellianism, psychopathy, and sadism), based on the combination of the SD3 and the ASP, in three samples of Spaniards.

The CFA conducted on the four five-item subscales yielded a satisfactory fit to the structure (which supported the study hypothesis), like the findings of Paulhus et al. (2021) in their development of the 28-item SD4. However, when comparing models, it is important to strike a balance between fitting indices and model parsimony (Vandekerckhove et al., 2015), which justifies the reduction of items in the D20 scale. The 36-item scale, combining the SD3 (Jones & Paulhus, 2014) and the ASP (Plouffe et al., 2017), also exhibited good fit indices in this study. Although some items, particularly the reversed ones, did not perform well, the use of the 36-item scale allowed for cross-cultural comparisons in previous studies (Pineda et al., 2020, 2021).

The internal consistency of the 20-item measure showed acceptable to good reliability, with Machiavellianism and sadism obtaining higher values and narcissism demonstrating lower reliability. Similar results were observed in the longer 36-item version (SD3 + ASP) and the Spanish SD4 28-item version (Ortet-Walker et al., 2021, 2022). In addition, test-retest reliability of the D20 subscales indicated consistent and strong indices, supporting the scale's reliability in assessing the intended constructs.

As anticipated based on prior research, gender differences were observed, with men scoring higher on these traits (Paulhus et al., 2021; Pineda et al., 2020). However, the structure invariance across genders of the measures used to assess these traits has been less studied (e.g., Meng et al., 2022). Results of this study suggest that these differences between genders are not better explained by different factor structures of the D20 for men or women.

Regarding validity, the D20 demonstrated proper criterion validity through expected associations with related constructs. Divergent relationships were observed with scales measuring prosocial behaviour and conceptually opposite personality traits, while convergent relationships were found with measures assessing similar constructs and other

problematic behaviours (e.g., Muris et al., 2017; Naor-Ziv et al., 2022; Papageorgiou et al., 2020; Pineda et al., 2020, 2021; Schreyer et al., 2023).

In terms of construct validity, the D20 exhibited large correlations with other measures assessing the Dark Tetrad traits, such as the SD3 + ASP and SD4, indicating measurement convergence (Cohen, 1988). Comparisons with the widely used combination of the SD3 and ASP revealed high correlations, suggesting that the same underlying constructs are being measured, consistent with findings from other item reductions in similar constructs (Meng et al., 2022). Moderately large correlations, albeit smaller than the previous comparison, were observed with the SD4 developed by Paulhus et al. (2021). These differences may stem from variations in item pools, as both scales conceptualize the same constructs but employ different items due to the limited number of items in each scale (Niemi et al., 1986). Notably, the everyday sadism trait in the SD4 exhibited high correlations with the D20 scales of Machiavellianism and psychopathy. This could be attributed to differences in definitions and item pools used in the development of the scales, as the SD4 drew upon the definition by Buckels et al. (2013) for the Comprehensive Assessment of Sadistic Tendencies (CAST), while items of this study were derived from the ASP (Plouffe et al., 2017).

Study 6, objective 6. Objective and indirect assessment instruments of the Dark Triad and Dark Tetrad 20 years later: a systematic review

The objective of this study was to summarise the instruments that have been used to assess the Dark Triad and Dark Tetrad traits in a more indirect way (i.e., different from self-report assessment). In other words, to synthesise all objective measures used to assess characteristics related to these dark traits, thus allowing for their indirect assessment. To this end, a systematic review of studies published up to April 2021 was conducted.

To begin with, it is crucial to highlight that the only objective instruments designed to concretely assess the dark traits (and not variables related to them) are peer-reports and machine-learning techniques (included in the "other" category in this review) (e.g., Mahmud et al., 2021; Malesza & Kaczmarek, 2020; Rogers et al., 2018). Most of the existing instruments objectively measure constructs that are associated with these malevolent traits, making them indirect and objective measures of these traits rather than specifically targeting the traits themselves. It is noteworthy that machine-learning techniques, which had not been considered as a category for classifying measures due to ignorance, have made substantial advancements in society, and now serve as a valuable tool for predicting human behaviour and personality traits with increasing objectivity (Bleidorn & Hopwood, 2019). Therefore, future research could consider incorporating machine-learning as a distinct category for classifying objective measures.

As observed, OPTs involve individuals performing tests or engaging in situational tasks that allow their personality to be evaluated based on their behaviour in those specific contexts. In this way, personality assessment occurs by examining variables that are defined within the framework of these tests and tasks. Consequently, OPTs can be considered an indirect and objective approach to evaluating personality, operating under the assumption that traits manifest through observable behaviour in standardized task or situations. Therefore, traits can be measured by assessing the characteristics associated with them (Cattell & Warburton, 1967; Furr, 2009; Hernández-López et al., 1999; Kubinger, 2009; McDonald, 2008; Santacreu, 2009; Santacreu & Hernández, 2018).

Regarding the characteristics of the studies that fulfilled the inclusion criteria, it is noteworthy that only two studies were identified prior to 2010, which may be attributed to the fact that in 2010, the first dedicated self-report measure for assessing the three Dark Triad

traits, known as the DTDD, was validated (Jonason & Webster, 2010). During this period, researchers may have been primarily interested in directly measuring the Dark Triad traits. Additionally, it is worth mentioning that from 2016 onwards, there appears to be an increasing interest in the use of indirect measures, as indicated by the growing number of localized publications during that time. Notably, the year 2021 had the highest number of located publications, considering that the search was conducted until April 2021 and did not cover the entire year. This observation underscores the heightened interest of researchers in recent years to utilize more indirect assessment tools in addition to self-report measures (Hernández-López et al., 1999; Lozano-Bleda et al., 2010; Rubio et al., 2004; Santacreu & Hernández, 2018).

A limited number of studies have been identified that incorporate the assessment of the Dark Tetrad alongside the objective assessment of associated constructs. Consequently, the availability of indirect measures for assessing the Dark Tetrad is relatively scarce. This may be attributed to the delayed inclusion of the sadism trait in in the set of dark traits (Chabrol et al., 2009) and the more recent development of dedicated self-report measures for assessing this particular trait (Paulhus et al., 2021; Plouffe et al., 2017; Webster & Wongsomboon, 2020).

To comprehensively examine the types of objective measures employed in the studies, a classification system consisting of six categories was proposed. This classification was based on the framework presented by Ortner and Proyer in 2015, with two additional categories included based on a thorough review of the existing literature (Abernethy, 2015; Cattell & Warburton, 1967; Connelly & Ones, 2010; Furr, 2009; McDonald, 2008): (1) OPTs masked as achievement tasks, (2) OPTs that aim to represent real-life simulations, (3) Questionnaire-type OPTs that ask for evaluations or decisions, (4) Objective measure in peer-report format, (5) Objective measure in biomedical data format, (6) Other (instruments that did not fit the other categories).

Most of the instruments included in this study were categorized according to the classification proposed by Ortner and Proyer (2015). Accordingly, most of the objective measures (1) were presented as performance tasks disguised as achievement tasks, in which participants were required to solve tasks accurately and/or quickly (e.g., Guo et al., 2021; Lämmle & Ziegler, 2021; Markowitz & Levine, 2021); (2) were framed as tasks simulating real-life scenarios, in which participants had to address tasks of varying complexity

embedded within authentic situations (e.g., Grover & Furnham, 2021; Malesza & Kalinowski, 2021b; Van Doesum et al., 2020); or (3) took the form of questionnaire-like tasks, in which participants were presented with items resembling questionnaires and asked to respond accordingly (e.g., Koschmieder & Neubauer, 2021; Laakasuo et al., 2021; Ok et al., 2021).

Many of the measures utilized in these studies were published prior to the primary self-report instruments for assessing the Dark Triad and the Dark Tetrad, although they have since undergone revisions (such as The Balloon Analogue Risk Task, Greene's dilemmas and Bartels' dilemmas, Raven's progressive matrices, or the Dictator game; Bartels, 2008; Eckel & Grossman, 1996; Greene et al., 2004; Lejuez et al., 2002; Raven, 1981). Consequently, their widespread use has contributed to the abundance of evidence regarding their effectiveness.

Regarding the variables measured with these instruments that have been related to the Dark Triad and Dark Tetrad traits, a great variety of them have been located. This diversity is interesting as it offers researchers numerous options to incorporate alternative and indirect measures of the dark traits, distinct from traditional self-report measures, into their investigations (Cattell & Warburton, 1967; Furr, 2009; Hernández-López et al., 1999; Kubinger, 2009; McDonald, 2008; Santacreu, 2009; Santacreu & Hernández, 2018).

Finally, the studies that have examined the associations between the Dark Triad or Dark Tetrad traits and other variables, which are defined within the context of the tests and thus indirectly assess the traits, offer valuable insights into the utility of the employed instruments. The presence of significant relationships between variables implies that the tools used in these studies were useful for indirectly assessing the malevolent traits of interest. However, it is crucial to consider the reliability values of the instruments, but unfortunately, many studies did not report them, which is an important aspect to consider when drawing conclusions.

In any case, it is important to acknowledge that objective measures are not without measurement errors, as some authors have noted weak correlations between self-report and behavioural measures of the same construct, which can limit their use (Dang et al., 2020; Ortner & Proyer, 2015). To mitigate this issue, it is recommended to prioritize measures with

high reliability for investigating individual differences and to use measures with lower reliability to track short-term changes in attributes (Dang et al., 2020).

Study 7, objective 7. Observer-reports as a complement to self-reports in the assessment of Dark Triad: a meta-analysis

The objective of this study was to analyse the accuracy of observer-reports in assessing the Dark Triad and Dark Tetrad traits. More specifically, the aim was to analyse the relationship between these traits assessed with self-report and assessed with observer-reports and to calculate effect sizes from the correlations between both types of assessment methodology for each of the four dark traits. For this purpose, two interrelated meta-analysis of studies published up to April 2021 was carried out.

It is pertinent to highlight that, despite including terms related to all four Dark Tetrad traits in the search query, the studies retrieved in both versions of the research solely employed observer-reports to assess the Dark Triad traits. No studies were identified that employed observer-reports to measure the complete Dark Tetrad, which includes sadism. This paucity of studies might be attributed to the subsequent inclusion of trait sadism into the set of dark traits (Chabrol et al., 2009). Furthermore, the relatively recent development of self-report measures specifically tailored to assess this particular trait alongside the other three traits could have contributed to the lack of studies (Paulhus et al., 2021; Plouffe et al., 2017; Webster & Wongsomboon, 2020).

It is also noteworthy to highlight the limited utilization of observer-reports in assessing these malevolent traits, as evidenced by the considerable number of studies excluded from the analysis due to their absence of observer-report measures. This scarcity of usage could be attributed to the ongoing debate in the literature regarding the accuracy of observer-reports in gauging personality traits, as well as the potential drawbacks associated with employing this methodology. Several disadvantages have been identified, including the additional effort and time required to collect data from third parties, which could be more expediently obtained through direct inquiries to the target individual. Additionally, informants may lack access to certain personal information, limiting the comprehensiveness of their assessments. Furthermore, observer-reports may face challenges in evaluating highly specific behaviours, and similar biases encountered in self-report measures, such as extreme responses or acquiescence, might also be present (Baker et al., 2004; Malesza & Kaczmarek, 2020; McDonald, 2008).

Thirdly, regarding the outcomes derived from the analyses conducted in this investigation, both versions of the study demonstrated a moderate positive correlation between the three traits assessed through self-report and observer-report methodologies. These results indicate a positive relationship between these assessment measures, implying that self-reports and observer-reports of these traits are moderately associated. Additionally, the findings align with the studies conducted by Malesza and Kaczmarek (2020) and Mischel (1968), as the correlations for all three traits in both versions of the meta-analysis surpass the minimum validity threshold of .30. Hence, the evidence suggests that observer-reports possess a certain level of accuracy, enabling the observation and assessment of these personality traits by others, which closely align with the targets' own perceptions of their traits (Jones & Paulhus, 2014; Luan et al., 2019; Malesza & Kaczmarek, 2020; Vazire, 2010).

The moderate correlations observed in this study can be attributed not only to the accuracy of the raters, but also to the possibility that raters might be observing distinct yet related phenomena while utilizing different sets of behaviours to evaluate the same trait (Larsen et al., 2017). Notably, narcissism emerged as one of the most easily observable traits, as evidenced by the highest associations obtained for this trait. This finding aligns with previous research, which suggests that familiarity tends to attract others with analogous characteristics to the targets in the case of narcissism, indicating that narcissism seems to exhibit a consistent pattern with different people. On the other hand, it is postulated that raters may employ less similar information or interpret it differently when assessing Machiavellianism and psychopathy (Lämmle et al., 2021; Maaß & Ziegler, 2017). However, our study also revealed that psychopathy, along with narcissism, appears to be one of the most readily observable traits. This outcome corroborates previous studies that similarly identified psychopathy as one of the traits that can be more easily observed (He et al., 2018; Jones & Paulhus, 2014; Malesza & Kaczmarek, 2020).

Furthermore, individuals with narcissistic traits appear to possess a self-awareness of their personality and the importance of maintaining a narcissistic image, leading them to present themselves to others in a narcissistic manner. In essence, their desire for public recognition motivates them to display behaviours that attract attention and admiration from others, making narcissism a more readily observable trait. On the contrary, individuals with Machiavellian traits (which the results indicate as the least observable trait) may strategically

present themselves as "good" to others, skilfully deceiving and manipulating them without being detected. This behaviour could make it challenging for others to observe this trait in individuals, resulting in an underestimation of its presence (Carlson et al., 2011; Lämmle et al., 2021; Maaß & Ziegler, 2017). As for individuals with psychopathic traits, they might also showcase their true nature similarly to narcissists, displaying a lack of concern for the impression they make on others (e.g., Miller et al., 2011). This distinction in trait visibility aligns with the conceptual definitions of each trait (Paulhus & Williams, 2002).

In the meta-analysis conducted by Connelly and Ones (2010), a moderate level of correlation was observed between self-reported personality traits and personality traits reported by others. The correlation coefficients ranged from .08 to .48, with the highest correlations observed when the informants were individuals who were closer to the target. This indicates a positive relationship between the two types of personality reports, although it is not a perfect correlation. Moreover, the accuracy of observer-reported personality traits varied depending on the specific trait being assessed. For instance, observers demonstrated higher accuracy in assessing extraversion and openness to experience, while their accuracy was lower in assessing neuroticism and agreeableness. In connection with this finding, observer-reports may be more valuable for assessing highly observable traits, such as narcissism or psychopathy (Luan et al., 2019; Vazire, 2010).

It is noteworthy that both versions of the meta-analysis revealed higher correlations in studies where acquaintances (e.g., family or friends) rated the dark personality traits of the targets. On the other hand, studies where the personality traits were rated by other Facebook users or trained research assistants showed lower magnitude correlations (Maaß & Ziegler, 2017; Vander Molen et al., 2018). The second version demonstrated that the type of informant moderates the relationship between traits measured via self-report and observer-report, with the association being stronger when observers are individuals who know the targets rather than strangers. These findings align with the results of Connelly and Ones' study (2010). However, this pattern was observed only for narcissism and psychopathy, and the reasons behind it could be like those mentioned earlier, although it may also be influenced by the smaller effect size for this trait ($k = 9$).

The findings imply that dark personality traits, particularly narcissism and psychopathy, are more readily observable by individuals who have a closer relationship with the target. Thus, higher familiarity leads to increased accuracy in assessing these traits

(Connelly & Ones, 2010; Vazire, 2006; Vazire & Mehl, 2008). However, Lämmle et al. (2021) suggest that personality observability is not solely influenced by familiarity, but it is also influenced by the specific situations that occur between the assessor and the individual being assessed.

CONCLUSIONS

Conclusions

The following conclusions can be drawn from the initial objectives of the research work carried out in this doctoral thesis:

1.   Narcissism and Machiavellianism were predicted positively by neuroticism and extraversion, and psychopathy was predicted negatively by extraversion and positively by psychopathy. Understanding the connections between the PEN model and the Dark Triad is important due to the PEN model's relevance in predicting antisocial and conflict behaviours. Furthermore, although the traits of the PEN model cannot fully capture the variance of the Dark Triad traits, they do exhibit significant associations.

On the other hand, the sincerity variable turns into a predictor of the scores in the three Dark Triad traits. The sincere responses provided by individuals with high scores in the Dark Triad traits may have implications. Considering the deceptive and manipulative nature of the Dark Triad, these findings would imply that these traits could be inaccurately measured in certain contexts. Additionally, it raises the possibility that individuals with high scores on dark traits may not place as much importance on how others perceive them. However, it is also worth considering that this study may have only detected individuals with high scores on dark traits who were more inclined to be sincere, while those who were insincere may not have been captured. Consequently, there is a need for further efforts to develop more objective measures for assessing dark personalities, such as implicit, indirect, task-based, or forced-choice assessments, as well as the inclusion of scales measuring social desirability in self-reported assessments.

2.   The Dark Triad traits are associated with civic engagement, with narcissism and openness to experience making specific positive contributions. The positive link between narcissism and general personality traits may explain why individuals with narcissistic traits exhibit a more favourable attitude towards civic behaviours, demonstrating a higher inclination towards good citizenship and greater engagement with their community.

It is crucial to acknowledge the connection between these dark traits and a range of violent behaviours. Hence, it is possible that individuals with narcissistic traits engage in civic behaviours to satisfy their own interests and bolster their self-esteem. Moreover, people are more likely to participate in collective actions when they are directly related to their personal interests.

Our study contributes to the understanding of how the narcissistic trait diverges from the other two malevolent traits comprising the Dark Triad. Given the association between these traits and maladaptive behaviours, as mentioned earlier, comprehending all the characteristics of these malevolent traits can inform the development of prevention programs targeting the reduction of such maladaptive behaviours. Therefore, it would be interesting to continue investigating the narcissistic trait, as it may serve as a self-protective factor against the other dark traits. Furthermore, exploring whether individuals with narcissistic traits are more prone to engaging in collective actions driven by personal benefits warrants further investigation.

3.   The association between narcissism and EI has been unclear, and the existence of a "dark EI" remains uncertain. Our study sheds light on the presence of individuals with narcissistic traits who exhibit high levels of EI, marking the first investigation to analyse latent profiles combining Dark Triad traits and EI. The findings suggest the existence of an EI with narcissistic traits, which may predispose individuals to experience specific emotions that maximize personal gain and influence others. Consequently, these individuals are more likely to possess high self-esteem, experience well-being, engage in prosocial behaviour, actively participate in their community, and exhibit lower personal distress and psychological difficulties. As indicated in the conclusions of the previous investigation, narcissism seems to behave differently from the rest of the dark traits, so it seems necessary to continue investigating this trait. Moreover, this study did not confirm the existence of a profile characterized by low scores on dark traits and high scores on EI.

These findings have important implications for the development of preventive interventions aimed at enhancing emotional education. It is crucial to consider negative personality traits when providing EI-based intra- and interpersonal skills, as offering such training to individuals with prominent dark traits may not be advisable. This caution is necessary due to the positive association between dark traits and a wide range of violent behaviours, which can pose risks to society.

4.   People with lower levels of dark traits and with a more restrictive sociosexual orientation display the least motivation to use Tinder for purposes other than finding a romantic partner. Conversely, individuals with slightly elevated scores on dark traits and high scores on sociosexual orientation (less restrictive sex) exhibit the highest motivation to

use Tinder for sexual purposes. Moreover, individuals with the highest scores on dark traits and slightly elevated scores on sociosexual orientation are motivated to use Tinder for a range of utilitarian purposes, including seeking social approval, enhancing social and flirting skills, reducing social pressure, keeping up with trends, seeking entertainment, and moving on from a previous partner. Consequently, our study reveals that individuals with moderate scores on the Dark Tetrad traits, rather than those with the highest scores, appeared to be most interested in using Tinder for sexual purposes.

Understanding the diverse motivations behind the usage of dating apps, as well as the characteristics of individuals utilizing these platforms, such as their personality traits, is crucial for comprehending the positive and negative impacts associated with their use. Considering the positive link between Dark Tetrad traits and a range of antisocial behaviours, including sexual aggression, it becomes essential to investigate the motivations driving individuals with less sexual restriction and higher levels of undesirable personality traits to use dating apps. This knowledge can inform the development of targeted prevention programs to address the potential misuse of dating apps and raise awareness regarding engaging with individuals for various purposes on these platforms.

5. Our research has succeeded in developing a brief and concise, as well as valid and reliable, measure of the Dark Triad of personality: the D20. This scale has been developed based on the combination of two of the main scales validated to measure the Dark Triad together with sadism, i.e., the SD3 and the ASP. Thus, the D20 allows the assessment of the dark traits as previously measured by using both scales together. By adhering to the principle of parsimony, our measure enables practitioners and researchers to efficiently evaluate these traits in situations where limited time is available for questionnaire completion.

6. Personality traits that are considered socially undesirable, such as the dark traits, are susceptible to assessment biases, including the influence of social desirability, specifically in the context of forensic psychology. Our systematic review is the first to compile all the objective instruments used for the indirect assessment of Dark Triad and Dark Tetrad traits, two decades after the publication of these malevolent traits. A wide range of tools have been identified that enable the indirect assessment of these dark traits by measuring objectively variables defined within the context of these measures. These findings

provide researchers with a diverse set of measures to consider when aiming to address self-report biases and obtain more reliable results.

Research stress that the best approach to assessment will combine different measurement methods. Therefore, researchers are encouraged to continue utilizing the objective instruments identified in this systematic review for assessing Dark Triad and Dark Tetrad traits. Furthermore, it is recommended to develop new tools that can provide further insights into the validity of these measures and their correlation with self-reports. In this review, we propose referring to this set of measures as Objective Personality Measures (OPMs), considering the new classification of six categories proposed in this work, including the OPTs by Ortner and Proyer (2015), as well as other types of tools beyond tests.

7. This is the first meta-analysis summarizing the studies that have used observer-reports as a means of assessing dark traits. It offers comprehensive statistical data on the accuracy of observer-reports as a complementary approach to self-reports for evaluating these malevolent personality traits. The basis of this work was that observer-reports are particularly advantageous when assessing socially desirable or undesirable traits compared to neutral traits. This is because neutral traits are less influenced by biases arising from the tendency to present oneself in socially desirable terms.

As a result, the first version of the meta-analysis that focused on studies that included at least all traits of the Dark Triad or Dark Tetrad to ensure their assessment as originally conceptualised yielded seven studies with eight effect sizes; the second version that focused on studies that assessed at least one of the traits independently yielded 13 studies with 17 effect sizes.

This study concludes that the assessment of malevolent personality could benefit from the use of observer-report as the findings showed positive associations of medium magnitude between narcissism, Machiavellianism, and psychopathy assessed with self-report and with observer-reports. Specifically, narcissism and psychopathy seem to be easier to observe. Furthermore, informant type moderates the relationships for these two traits, showing that they are easier to observe by those who have a closer relationship with the target. Thus, the greater the familiarity with the target, the greater the accuracy of trait assessment. In conclusion, a comprehensive and robust assessment of any given construct is most effectively achieved through the integration of multiple measurement methods.

In sum, two conclusions can be drawn from this doctoral thesis. On the one hand, due to the relationship of the dark traits analysed here with a wide variety of negative psychosocial outcomes, it seems relevant to further deepen their analysis to better understand them. The Dark Tetrad, like general personality, can lead to a better understanding of human behaviour, which in turn can improve the design of preventive measures, as well as the design of better treatments and interventions to improve people's well-being. Therefore, as recent literature has shown, its analysis is becoming increasingly relevant.

In turn, the findings obtained in this doctoral thesis highlight the need to continue studying the subclinical narcissistic personality trait. Like previous studies, this trait, despite being considered malevolent, maintains a positive relationship with some socially desirable variables, such as EI and civic engagement. However, as has been argued, individuals with high scores on this trait may display these positive characteristics to achieve self-beneficial goals, which, again, makes them still display a malevolent personality (like the other three dark traits).

On the other hand, self-report is the most widely used assessment methodology in the study of personality because of its many advantages. Moreover, the scales used to measure the dark traits present adequate psychometric properties, such as the short measure validated in this doctoral thesis. However, it is important to consider the weaknesses of this assessment method (as with any other methodology), especially the presence of social desirability. This becomes even more relevant for the assessment of undesirable personality traits and characteristics and thus for forensic psychology. Moreover, the relationship between these dark traits and sincerity seems to be unclear since these persons could be sincere if they do not have an interest in not presenting themselves as they are. Therefore, using other tools that allow a more objective and indirect assessment may be the key to achieve more comprehensive and accurate assessments.

This doctoral thesis has presented a synthesis of the objective tools used for the indirect assessment of the Dark Triad and Dark Tetrad traits 20 years after the publication of this set of malevolent traits. Statistical data on the accuracy of observer-reports have also been presented. Therefore, in conclusion, the use of these OPMs is suggested to complement the use of self-reports.

Conclusiones

De los objetivos iniciales del trabajo de investigación realizado en esta tesis se pueden extraer las siguientes conclusiones:

1. El narcisismo y el maquiavelismo fueron predichos positivamente por el neuroticismo y la extraversión, y la psicopatía fue predicha negativamente por la extraversión y positivamente por la psicopatía. Comprender las conexiones entre el modelo PEN y la Tríada Oscura es importante debido a la relevancia del modelo PEN en la predicción de conductas antisociales y conflictivas. Además, aunque los rasgos del modelo PEN no pueden capturar completamente la varianza de los rasgos de la Tríada Oscura, sí muestran asociaciones significativas.

Por otro lado, la variable sinceridad predice las puntuaciones en los tres rasgos de la Tríada Oscura. Las respuestas sinceras proporcionadas por personas con puntuaciones altas en los rasgos de la Tríada Oscura pueden tener implicaciones. Teniendo en cuenta la naturaleza engañosa y manipuladora de la Tríada Oscura, estos hallazgos implicarían que estos rasgos podrían medirse de forma inexacta en determinados contextos. Además, se plantea la posibilidad de que los individuos con puntuaciones altas en rasgos oscuros no den tanta importancia a cómo los perciben los demás. No obstante, también es importante apreciar la posibilidad de que este estudio haya detectado solo a los individuos con puntuaciones altas en los rasgos oscuros que tenían más tendencia a ser sinceros, mientras que los que no lo eran pueden no haber sido captados. En consecuencia, parece necesario realizar más esfuerzos para desarrollar medidas más objetivas para evaluar las personalidades oscuras, como evaluaciones implícitas, indirectas, basadas en tareas o de elección forzada, así como la inclusión de escalas que midan la deseabilidad social en las evaluaciones autoinformadas.

2. Los rasgos de la Tríada Oscura se asocian con el compromiso cívico, siendo el narcisismo y la apertura a la experiencia los factores más fuertemente asociados con el compromiso (con relaciones positivas). La relación positiva entre el narcisismo y los rasgos generales de personalidad podría explicar por qué los individuos con rasgos narcisistas muestran una actitud más favorable hacia los comportamientos cívicos, mostrando un mayor compromiso con su comunidad.

También parece relevante contemplar la relación entre estos rasgos oscuros y una variedad de comportamientos violentos, puesto que es posible que las personas con rasgos

narcisistas participen en comportamientos cívicos para satisfacer sus propios intereses y reforzar su autoestima. Además, es sabido que es más probable que las personas participen en acciones colectivas cuando estas están directamente relacionadas con sus intereses personales.

Nuestro estudio contribuye a la comprensión de cómo el rasgo narcisista diverge de los otros dos rasgos malévolos que componen la Tríada Oscura. Dada la asociación entre estos rasgos y una gran variedad de conductas desadaptativas, como se mencionó anteriormente, comprender todas las características de estos rasgos puede mejorar el desarrollo de programas de prevención dirigidos a la reducción de tales conductas desadaptativas. Por lo tanto, parece relevante seguir investigando el rasgo narcisista, puesto que a nivel individual podría resultar como un factor de autoprotección frente a los otros rasgos oscuros. Además, explorar si los individuos con rasgos narcisistas son más propensos a participar en acciones colectivas impulsadas por beneficios personales merece una investigación más profunda.

3.	La asociación entre el narcisismo y la IE ha sido poco clara, y la existencia de una "IE oscura" sigue siendo incierta. Nuestro estudio aporta datos sobre la presencia de individuos con rasgos narcisistas que muestran altos niveles de IE, siendo la primera investigación que analiza perfiles latentes que combinan rasgos de la Tríada Oscura y la IE. Los resultados sugieren la existencia de una IE con rasgos narcisistas, que puede predisponer a los individuos a experimentar emociones específicas que maximicen el beneficio personal e influyan en los demás. En consecuencia, es más probable que estos individuos posean una alta autoestima, experimenten bienestar, se involucren en conductas prosociales, participen activamente en su comunidad y muestren menor angustia personal y dificultades psicológicas. Como se indicó en las conclusiones de la investigación anterior, el narcisismo parece manifestarse de forma diferente al resto de rasgos oscuros, por lo que parece necesario seguir investigando este rasgo. Además, este estudio no confirmó la existencia de un perfil caracterizado por puntuaciones bajas en los rasgos oscuros y puntuaciones altas en la IE.

Estos hallazgos tienen importantes implicaciones para el desarrollo de intervenciones preventivas dirigidas a mejorar la educación emocional. Parece crucial tener en cuenta los rasgos negativos de personalidad a la hora de proporcionar habilidades intra e interpersonales basadas en la IE, ya que ofrecer este tipo de entrenamiento a individuos con rasgos oscuros prominentes puede no ser aconsejable. Este hecho se debe a la asociación

positiva entre los rasgos oscuros y una amplia gama de comportamientos violentos, que pueden suponer riesgos para la sociedad.

4.   Las personas con niveles más bajos de rasgos oscuros y con una orientación sociosexual más restrictiva muestran la menor motivación para utilizar Tinder con fines distintos a la búsqueda de una pareja romántica. Por el contrario, las personas con puntuaciones ligeramente elevadas en los rasgos oscuros y puntuaciones altas en orientación sociosexual (sexo menos restrictivo) muestran la mayor motivación para utilizar Tinder con fines sexuales. A su vez, las personas con las puntuaciones más altas en los rasgos oscuros y puntuaciones ligeramente elevadas en la orientación sociosexual están más motivadas para utilizar Tinder con distintos fines utilitarios, incluyendo la búsqueda de aprobación social, la mejora de las habilidades sociales y de coqueteo, la reducción de la presión social, el mantenerse al día con las tendencias, la búsqueda de entretenimiento, y el superar a una expareja. En consecuencia, nuestro estudio revela que las personas con puntuaciones moderadas en los rasgos de la Tétrada Oscura, más que aquellos con las puntuaciones más altas, parecen estar más interesadas en utilizar Tinder con fines sexuales.

Comprender las diversas motivaciones que subyacen al uso de aplicaciones de citas, así como las características de las personas que utilizan estas plataformas, como sus rasgos de personalidad, es crucial para comprender los impactos positivos y negativos asociados a su uso. Teniendo en cuenta la relación positiva entre los rasgos de la Tétrada Oscura y una serie de comportamientos antisociales, incluida la agresión sexual, resulta esencial investigar las motivaciones que conducen a los individuos con menos restricciones sexuales y mayores niveles de rasgos de personalidad indeseables a utilizar aplicaciones de citas. Este conocimiento puede servir de base para el desarrollo de programas de prevención dirigidos a abordar el posible uso indebido de las aplicaciones de citas y concienciar sobre los distintos motivos por los que las personas usan estas plataformas.

5.   Nuestra investigación ha logrado desarrollar una medida breve y concisa, además de válida y fiable, para evaluar la Tétrada Oscura de la personalidad: la D20. Esta escala se ha desarrollado en base a la combinación de dos de las principales escalas validadas para medir la Tríada Oscura junto con el sadismo, es decir, la SD3 y el ASP. Por ello, la D20 permite la evaluación de los rasgos oscuros tal y como se han medido previamente mediante el uso ambas escalas conjuntamente. Al adherirnos al principio de parsimonia, nuestra

medida permite a los profesionales e investigadores evaluar eficazmente estos rasgos en situaciones en las que se dispone de un tiempo limitado para cumplimentar el cuestionario.

6.   Los rasgos de personalidad que se consideran socialmente indeseables, como los rasgos oscuros, son susceptibles de los sesgos de evaluación, incluida la influencia de la deseabilidad social, específicamente en el contexto de la psicología forense. Nuestra revisión sistemática es la primera que recopila todos los instrumentos objetivos utilizados para la evaluación indirecta de los rasgos de la Tríada y la Tétrada Oscura, dos décadas después de la publicación de estos rasgos malévolos. Se ha identificado una amplia gama de instrumentos que permiten evaluar indirectamente estos rasgos oscuros midiendo objetivamente variables definidas en el contexto de estas medidas. Estos hallazgos proporcionan a los investigadores un conjunto diverso de medidas a considerar cuando se pretenda abordar los sesgos del autoinforme y obtener resultados más fiables.

Las investigaciones destacan que el mejor enfoque de evaluación será aquel que combine diferentes métodos de medición. Por lo tanto, se anima a los investigadores a seguir utilizando los instrumentos objetivos identificados en esta revisión sistemática para evaluar los rasgos de la Tríada y la Tétrada Oscura. Además, se recomienda desarrollar nuevas herramientas que puedan proporcionar más información sobre la validez de estas medidas y su correlación con los autoinformes. En esta revisión, proponemos referirnos a este conjunto de medidas como Medidas Objetivas de Personalidad (OPMs), considerando la nueva clasificación de seis categorías propuesta en este trabajo, incluyendo las OPTs de Ortner y Proyer (2015), así como otros tipos de herramientas más allá de los test.

7.   Este es el primer metaanálisis que resume los estudios que han utilizado informes de observadores como medio para evaluar los rasgos oscuros. Se ofrecen datos estadísticos exhaustivos sobre la precisión de los informes de observadores como enfoque complementario a los autoinformes para evaluar estos rasgos malévolos. Este trabajo se fundamentó en que los informes de los observadores son especialmente ventajosos a la hora de evaluar rasgos socialmente deseables o indeseables en comparación con los rasgos neutros. Esto se debe a que los rasgos neutros están menos influidos por los sesgos derivados de la tendencia a presentarse en términos socialmente deseables.

Como resultado, la primera versión del metaanálisis que se centró en estudios que incluían al menos todos los rasgos de la Tríada o de la Tétrada Oscura para garantizar su

evaluación tal y como se conceptualizó originalmente, ofreció siete estudios con ocho tamaños del efecto; la segunda versión que se centró en estudios que evaluaban al menos uno de los rasgos de forma independiente, ofreció 13 estudios con 17 tamaños del efecto.

Este estudio concluye que la evaluación de la personalidad malévola podría beneficiarse del uso de informes de observadores, ya que los resultados mostraron asociaciones positivas de magnitud media entre el narcisismo, el maquiavelismo y la psicopatía evaluados con autoinformes y con informes de observadores. En concreto, el narcisismo y la psicopatía parecen ser más fáciles de observar. Además, el tipo de informante modera las relaciones para estos dos rasgos, mostrando que son más fáciles de observar por aquellos que tienen una relación más cercana con el objetivo. Así pues, cuanto mayor es la familiaridad con el objetivo, mayor es la precisión en la evaluación de los rasgos. En conclusión, una evaluación exhaustiva y robusta de cualquier constructo dado se logra más eficazmente mediante la integración de múltiples métodos de medición.

En resumen, se pueden extraer dos conclusiones de esta tesis doctoral. Por un lado, debido a la relación de los rasgos oscuros aquí analizados con una amplia variedad de resultados psicosociales negativos, parece relevante seguir profundizando en su análisis para comprenderlos mejor. La Tétrada Oscura, al igual que la personalidad en general, puede conducir a una mejor comprensión del comportamiento humano, lo que a su vez puede mejorar el diseño de medidas preventivas, así como el diseño de mejores tratamientos e intervenciones para mejorar el bienestar de las personas. Por ello, como ha demostrado la literatura reciente, su análisis es cada vez más relevante.

A su vez, los hallazgos obtenidos en esta tesis ponen de manifiesto la necesidad de continuar estudiando el rasgo de personalidad narcisista subclínico. Acorde con la literatura previa, este rasgo, a pesar de ser considerado malévolo, mantiene una relación positiva con algunas variables socialmente deseables, como la inteligencia emocional y el compromiso cívico. Sin embargo, como se ha argumentado, las personas con puntuaciones elevadas en este rasgo podrían mostrar estas características positivas para lograr objetivos de beneficio propio, lo que, de nuevo, hace que sigan mostrando una personalidad malévola (como los otros tres rasgos oscuros).

Por otro lado, el autoinforme es la metodología de evaluación más utilizada en el estudio de la personalidad debido a sus numerosas ventajas. Además, las escalas utilizadas

para medir los rasgos oscuros presentan propiedades psicométricas adecuadas, como la medida corta validada en esta tesis doctoral. Sin embargo, es importante considerar las debilidades de este método de evaluación (como con cualquier otra metodología), especialmente la presencia de deseabilidad social. Esto resulta aún más relevante para la evaluación de características y rasgos de la personalidad indeseables y, por tanto, para la psicología forense. Además, la relación entre estos rasgos oscuros y la sinceridad parece no estar clara, ya que estas personas podrían ser sinceras siempre y cuando no tengan un interés en no presentarse tal y como son. Por ello, la utilización de otras herramientas que permitan una evaluación más objetiva e indirecta puede ser la clave para conseguir evaluaciones más completas y precisas.

En esta tesis doctoral se ha presentado una síntesis de las herramientas objetivas utilizadas para la evaluación indirecta de los rasgos de la Tríada Oscura y la Tétrada Oscura 20 años después de la publicación de este conjunto de rasgos malévolos. También se han presentado datos estadísticos sobre la precisión de los informes de los observadores. Por lo tanto, en conclusión, se sugiere el uso de estas OPM para complementar el uso de autoinformes.

Limitations and future directions

The research carried out in this doctoral thesis has some limitations which will be described below along with a proposal for future developments of such research:

1.   One limitation of the first study was associated with the measurement instruments employed. Firstly, the Dark Triad scale, despite demonstrating satisfactory reliability coefficients, can be regarded as a preliminary or screening tool due to its simplicity. Criticisms have also been raised regarding certain measurement issues within the Dark Triad construct (Kajonius et al., 2016). Therefore, the utilization of more specific measures for each trait within the Dark Triad would be advantageous.

Additionally, the sincerity scale of the EPQR-A may not be optimal for assessing this construct, as it was originally developed as a validity scale with a notable focus on antisocial aspects. Moreover, the reliability values for this scale were low, presenting another limitation of this study. Consequently, it would be valuable to further explore sincerity within these personalities using different instruments and incorporating sincerity items to generate more objective measures for evaluating these traits. Finally, the psychoticism scale also

demonstrated low internal consistency values, which may explain its limited correlation with Dark Triad psychopathy.

2.   One limitation of second study was the difficult to generalize the results in relation to civic engagement. As previously discussed, the treatment and operationalization of this concept can vary, leading to different outcomes and varying associations with other variables. Therefore, future research could consider utilizing a more specific questionnaire to measure civic engagement to compare these findings.

Another limitation pertains to the lack of available internal consistency calculations for the instrument used to assess the Big Five personality traits. Additionally, there were low correlations observed between some items within the factors, particularly within the agreeableness, suggesting potential reliability issues. Similarly, the Cronbach's alpha coefficients for narcissism and psychopathy were not high, indicating concerns regarding reliability. Replicating this study using other scales could be relevant.

Finally, as this study employs a cross-sectional design, it is difficult to generalize the results and establishing causal relationships between variables. Future research could explore the associations between civic engagement and both general and malevolent personality traits using longitudinal designs.

3.   There were several limitations in the third study that need to be addressed. Firstly, the cross-sectional design employed restricts the generalizability of the findings and hinders the establishment of causal relationships. To gain a deeper understanding and explore the causality of variables, future research could consider adopting a longitudinal design. Secondly, the use of convenience sampling was another limitation, as it limits the extent to which the results can be generalized to the broader population. It is essential to consider alternative sampling methods to ensure a more representative sample. Lastly, the study encountered issues with the low internal consistency of certain subscales. This calls for the improvement of measurement instruments in future studies.

4.   Regarding the limitations of the fourth study, it is important to acknowledge the constraints associated with sample size, the over-representation of women, the sample type, and the cross-sectional design, which make it difficult to generalize the findings. To address these limitations, future research is recommended to replicate the study with a larger sample size and a longitudinal design, allowing for more robust evidence of the obtained

results. Additionally, conducting replications in diverse countries and cultures would help assess the generalizability of these findings.

Furthermore, while a recent systematic review suggests that dating app usage is widespread across sociodemographic variables, including gender, age, marital status, sexual orientation, education, and income level (Castro & Barrada, 2020), studies have identified differences between men and women in their motivations for using Tinder (e.g., Lyons et al., 2022). Hence, it would be interesting to replicate the LPA with a larger sample size, enabling the development of distinct profiles for women and men. This approach would facilitate the examination of potential differences between genders in terms of their usage motivations.

5.   The fifth study also had some limitations. Firstly, while one of the studies collected a large sample of participants, the other two studies had a smaller participation rate. Consequently, the correlation analysis between the D20 and the SD4 was conducted with a relatively small sample size, although the ICC analysis has shown accurate performance with even smaller samples (Koo & Li, 2016). Additionally, a notable limitation concerning the participants was the predominance of women, which raises concerns about the generalizability of the findings. Therefore, future studies should aim to address these limitations and further validate these results.

Finally, another limitation of this study refers to the low reliability observed for narcissism in both the shortened D20 scale and the longer version of the SD3 + ASP combination. However, previous studies conducted in Spanish have also reported similar low reliability values (Fernández del Río et al., 2019; Pineda et al., 2021, 2023), so it would be interesting to analyse the reason for this finding, considering the possibility that it is because people with narcissistic traits show greater social desirability in self-reports in some contexts.

6.   The systematic review had several limitations. One limitation was the challenge of classifying all objective measures according to a previous classification model due to the scarcity of studies in this area. Ortner and Proyer (2015) indicated that OPTs constitute a heterogeneous group, making it difficult to establish a comprehensive classification that encompasses all existing types of OPTs. In this review, an alternative classification consisting of six categories (including an "others" category) was proposed, incorporating the three categories suggested by Ortner and Proyer (2015). However, there

were instances where certain instruments seemed to fit into multiple categories, requiring consensus among the reviewers. Therefore, further research is needed to explore and refine the classification proposed by Ortner and Proyer (2015) as well as the six-category classification proposed in this review.

Another limitation of this study is the inclusion criterion that required the analysis of at least three traits (narcissism, Machiavellianism, and psychopathy) that constitute the Dark Triad. While this criterion aimed to examine the traits as originally conceptualized, it may have excluded studies that utilized objective measures but assessed only one or two of the traits. Including such studies would have substantially increased the number of included studies and is therefore suggested as a potential avenue for future research.

Finally, although the focus of this review was not to examine the relationships between dark traits and the variables assessed within the context of the measures, the limited availability of data on such relationships in some studies restricted the ability to draw conclusive findings regarding the utility of the instruments for measuring dark traits. Therefore, future research should continue utilizing these instruments and further explore the associations between dark traits and the variables defined within the measure contexts.

7.   The latest study also had several limitations. Firstly, the number of studies meeting the inclusion criteria was limited, resulting in a small sample size for the analyses. Consequently, caution should be exercised when generalizing the findings. Secondly, all the included studies adopted a cross-sectional design, which restricts the ability to establish causal relationships and generalizability of the results over time. As a future direction for research, it is recommended to conduct regular updates to this meta-analysis to enhance the reliability of results concerning the accuracy of observer-reports as a personality assessment methodology, encompassing both general personality traits and dark traits.

Moreover, it is essential to note that in the second version of the meta-analysis, one exclusion criterion was eliminated to augment the pool of studies fulfilling the inclusion criteria. As a prospective avenue of investigation, we recommend conducting a direct replication of this meta-analysis while adhering to the inclusion criteria employed in the second version. However, it should be acknowledged that this may result in a substantially larger number of studies, which could present challenges in terms of data management.

Regardless, when interpreting the results obtained in this meta-analysis, it is crucial to consider the substantial heterogeneity observed between samples in both studies' analyses. This indicates that the correlation between self-reports and observer-reports might be subject to variations depending on the characteristics of the sample, including differences in the sizes of the included studies. Additionally, the significant τ^2 values obtained for each analysis suggest the presence of unexplained sources of heterogeneity, which should be investigated in future research (Hoaglin, 2016).

Lastly, it is crucial to highlight that the validity of certain brief scales utilized in the studies incorporated within this meta-analysis (specifically, SD3 and DD) has come under scrutiny. There are concerns that these abbreviated measures might not comprehensively assess all dimensions of the dark traits. Consequently, it is of paramount significance to thoroughly examine the psychometric properties of both self-reported and observer-reported scales during research investigations (Muris et al., 2017).

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APPENDICES

Appendix 1

Study 1

Are the Dark personalities sincere? Connections between the Dark Triad and the Big Three

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Are the Dark personalities sincere? Connections between the Dark Triad and the Big Three
Abstract

Background

There are different theories and models of personality. In the antisocial area, the model used is the Dark Triad, a model of personality composed of the traits of Machiavellianism, psychopathy, and narcissism. The links between the Dark Triad and other general models have been widely studied, however, there is little research connecting it with the traditional, but still used, model of personality described by Eysenck (psychoticism, extraversion, and neuroticism). Therefore, the aim of this study was to analyse the connections between the Dark Triad of personality and Eysenck's personality model. Additionally, we also interpret the connections between the sincerity scale of Eysenck's model and the Dark Triad.

Participants and procedure

Our final sample was composed of 2385 participants who completed different personality questionnaires measuring the Dark Triad and Eysenck's model. Bivariate analyses and structural equation modeling were performed.

Results

Narcissism and Machiavellianism have positive connections with neuroticism and extraversion, whereas psychopathy is positively associated with psychoticism and negatively associated with extraversion. All the Dark Triad traits, mainly Machiavellianism, show the strongest connections with sincerity.

Conclusions

Considering the deceptive and manipulative nature of the Dark Triad, these results would imply that these traits could be mismeasured in some contexts. However, in research conditions those people who score higher on the Dark Tetrad traits, do not hide behaviours that tend to be socially undesirable, implying some degree of honesty in their answers. Further efforts to develop more objective measures, such as implicit, indirect, task-based, or forced-choice measures, should be considered.

Keywords: Dark personality traits; social desirability; sincerity; Eysenck; PEN model.

Background

When we speak about personality, we put into words the way we function interpersonally and our individual differences, understood as our collection of thoughts, behaviours, and emotional patterns (Allport, 1961). After this definition, several models of personality have been developed to cover and explain these patterns of behaviour.

On the one hand, there is a theory whose main objective is to explain and describe the "dark" personality, that is, the malevolent personality. This construct of aversive personality is called The Dark Triad and is composed of a set of three traits that Paulhus and Williams (2002) described to form it: Machiavellianism, psychopathy and narcissism. Although each of the traits describes individual antisocial characteristics that lead to different negative outcomes, the three of them have some similarities, building this model of aversive personality (Muris et al., 2017). More specifically, Machiavellianism would be defined as a cunning and deceitful way of behaving that pursues only their own goals without thinking about the means used to achieve them, mainly manipulating others by exploiting them as mere resources (Fehr et al., 1992). A person with high scores in narcissism would be a self-centred person who only thinks of themselves as a grandiose human being superior to others with a high sense of entitlement and often looking for attention (Raskin & Hall, 1981). The last trait is psychopathy, which differs from the clinical idea of psychopathy, is characterized by callous personalities with low morality and almost no empathy, who look for activating activities even if this implies antisocial behaviours (Hare, 1999).

On the other hand, Eysenck and Eysenck, (1975) developed the PEN model to describe the spectrum of common patterns of thinking and behaving. This model — "The Big Three" — is also composed of three traits of personality: neuroticism, extraversion, and psychoticism. Neuroticism, against emotional stability, describes a pattern of high affectivity, trait anxiety, and mood instability, which is related to impulsivity and risk-taking (Peters et al., 2020). Extraversion, as opposed to introversion, would describe a person with a tendency to interact with the environment while relating to other people and externalizing their emotions and feelings. And finally, psychoticism, the opposite of warm-heartedness, is the most antisocial trait as described by Eysenck. It is characterized by a lack of empathy, aggressiveness, and hostility against others, implying risky behaviours in the pursuit of arousing sensations. Following these descriptions, it can be inferred that the construct of psychoticism is the most closely related to the Dark Triad personality (Paulhus & Williams, 2002). Some authors even consider psychoticism to be the same construct as psychopathy (e.g., Kajonius et al., 2016).

After Eysenck developed his model of personality, other authors appeared intending to cover and explain all the possibilities of personality. These are mainly the Five-Factor (FFM) (Goldberg, 1993) and the HEXACO (Ashton & Lee, 2001) models of personality. Although these new models of personality conceptualize personality in a more complex way, the PEN model is still used due to its simplicity and the fast application of the Eysenck Personality Questionnaire Revised-Abbreviated (EPQR-A; Francis et al., 1992; Pineda et al., in press). Additionally, the EPQR-A presents a "lie" or a sincerity scale, that measures the bias to "fake good" as a sincerity scale.

In this sense, another question arises: are people with malevolent traits sincere? Based on the literature, it seems important to consider social desirability when examining undesirable behaviours and personality traits, such as drug use, unethical behaviour or malevolent personality traits, as it is more likely that people who score high on these behaviours or traits may manipulate their responses to present themselves as more socially desirable (Althubaiti, 2016; Andrews & Meyer, 2003; Echeburúa et al., 2011; Rogers et al., 2002; Spaans et al., 2017; Vigil-Colet et al., 2012). Therefore, it seems relevant to ask whether people with Dark Triad traits are sincere or whether, given their deceptive and manipulative nature, these people would present themselves as more desirable when responding in a self-report (Paulhus & Williams, 2002).There is extensive research investigating the links between The Dark Triad with the other two models of personality (FFM and HEXACO; Kayiş et al., 2021; Muris et al., 2017; O'Boyle et al., 2015). Moreover, there is some research done investigating the connections between the Three-Factor Theory of Personality and antisocial behaviours (e.g., Cale, 2006). But there is hardly any research, linking the Dark Triad itself with this "Big Three". Furthermore, the literature on this area reaches different conclusions (Mohammadzadeh & Ashouri, 2018; Pineda et al., 2018).

The Present Study

Therefore, with this investigation we aim to clarify the connections between these important models of personality, including the analysis of sincerity, and considering measurement error using structural equation modeling (SEM). According to the nature of the constructs of each personality trait from the models and previous studies, we expect that all the Dark Triad traits will present significant positive connections with psychoticism since this trait is described as the most antisocial one from the PEN model of personality; psychopathy being the most related to it because of their similarities (Mohammadzadeh & Ashouri, 2018). Taking into consideration that narcissism is a trait that presents multiple dimensions (i.e., vulnerable and grandiose narcissism), we consider that it will be related to neuroticism due to their similarities in high sensitivity, as well as to critics from other people (Curtis & Jones, 2020). We do not have any predictions regarding Machiavellianism, besides the previous one linking it with psychoticism due to its antisocial nature (Mohammadzadeh & Ashouri, 2018).

Regarding the additional measure of the EPQR-A, the sincerity scale, we anticipate that people with high scores in the three Dark Triad traits will obtain higher scores on this scale. We expect this result as a consequence of their lack of concern about what other people think of them, only manipulating their image and thus the answers given on a questionnaire when there are specific objectives or purposes to be achieved (Carré et al., 2020; Fehr et al., 1992; Hare, 1999).

Participants and Procedure

Participants and procedure

The participants for this study were recruited for three years, from 2017 to 2019. From a large sample of 4584, $N = 2385$ met the inclusion criteria (being older than 18 years old and having completed the study measures), 1727 were women (72.4%) and 658 men (27.6%), with an average age of 28.98 ($SD = 10.39$), most of them Spanish (85.45%) or South American (12.70%) and highly educated (without basic studies 0.15%, primary school 8.99%, high school or vocational training 28.64%, university studies 62.13%).

Procedure

The recruitment was conducted using a convenience sampling method on the Internet, through social media like Twitter, Facebook, Instagram, and other similar sources. The database is submitted to a public repository. The study got the ethical approval from the University bioethics committee.

Measures

Dark Triad Dirty Dozen (DTDD)

The DTDD (Jonason & Webster, 2010) is a questionnaire that measures narcissism, Machiavellianism, and psychopathy with four items per trait, twelve in total. Participants answer the items on a Likert scale from 1 which means strongly disagree to 7, strongly agree. The scale applied was the Spanish translation of the Dirty Dozen (Pineda et al., 2018). For our sample, the internal consistency values were $\alpha = .82$, $\omega = .83$ for narcissism; $\alpha = .77$, $\omega = .79$ for Machiavellianism; and $\alpha = .64$, $\omega = .60$ for psychopathy.

Abbreviated form of the Revised Eysenck Personality Questionnaire (EPQR-A)

The EPQR-A is a personality test developed by Francis et al. (1992) from the original EPQ (Eysenck & Eysenck, 1975) and adapted to Spanish by Sandín et al. (2002). This questionnaire measures three personality traits (i.e., neuroticism, extraversion, and psychoticism) and uses one validity scale (i.e., sincerity) divided into 24 items with dichotomic yes/no answers. The internal consistency values for our sample were $\alpha = .75$, $\omega = .71$ for neuroticism; $\alpha = .83$, $\omega = .84$; for extraversion; $\alpha = .46$, $\omega = .50$ for psychoticism; and $\alpha = .56$, $\omega = .52$ for sincerity.

Data Analyses

Two programs were used to analyze the data, SPSS version 23rd to obtain the descriptive statistics and the bi-variate correlations, and R for the structural equation modelling to obtain the confirmatory factor analysis, the path model and the ratio of variance accounted for in the Dark Triad scales by the EPQR-A. The structural equation modeling was performed with the Lavaan package. To estimate parameters, we used the Diagonally weighted least squares (DWLS) procedure because it presents high accuracy and is specially developed for ordinal data, not starting from the assumption of normality in the distribution.

The path model (Figure 1) was elaborated including the two models of personality and paths from the Eysenck model to the Dark Triad. The fit indices that we used for fit interpretation were the comparative fit index (CFI), normed-fit index (NFI), goodness-of-fit statistic (GFI), the root mean square error approximation (RMSEA), and the standardized root mean square residual (SRMR). A good model fit would be concluded if SRMR was equal or less than .05 (acceptable until .08), RMSEA equal or less than .08, CFI greater than or equal to .95, GFI greater than or equal to .90, NFI greater than .90 and a non-significant χ^2 due to the sample size.

Before carrying out the analyses mentioned here, a t-test was performed to analyse the possible differences between the means on the scales between participants of Spanish origin and participants of South American origin (country variable). As a result, only slight differences were obtained for the Machiavellianism and psychopathy subscales. For this reason, it was considered appropriate to consider it as a single sample and not to carry out the subsequent analyses separately. We believe that, perhaps, the non-difference between means is due to the difference in sample size and to the fact that the question on country referred to the country of origin and not to the country of current residence.

The data that support the findings of this study are publicly available at https://osf.io/35kqb/ doi: 10.17605/OSF.IO/35KQB.

Results

Bivariate analyses were conducted to investigate the correlations between The Dark Triad traits, the Eysenck's major traits, and the scores of the sincerity scale of the EPQR-A instrument, as well as with sociodemographic variables (gender and age) (Table 1).

Table 1. Means (standard deviations) and correlations between the Dark Triad, the PEN model of personality, sincerity and sociodemographic variables.

	Mean (SD) N = 2385	1	2	3	4	5	6	7	8	9
1. Neuroticism	2.99 (1.96)	1								
2. Extraversion	3.85 (2.10)	-.18**	1							
3. Psychoticism	1.78 (1.27)	.10**	-.01	1						
4. Sincerity	3.27 (1.61)	.11**	-.04*	.16**	1					
5. Machiavellianism	4.50 (3.34)	.15**	.04	.20**	.47**	1				
6. Narcissism	6.35 (3.82)	.16**	.11**	.08**	.28**	.48**	1			
7. Psychopathy	3.06 (2.82)	.00	-.06**	.25**	.22**	.43**	.26**	1		
8. Sex	—	-.15**	-.07**	.17**	.10**	.14**	.11**	.22**	1	
9. Age	—	-.20**	.04	-.16**	-.23**	-.16**	-.10**	-.08**	.00	1

*p < .05, **p < .01. Gender was code as 1 = Female / 2 = Male.

Regarding the connections between the three of Eysenck's major traits and the Dark Triad, our predictions are supported by positive correlations between neuroticism with narcissism and, although not expected, with Machiavellianism. Moreover, the correlational analysis shows connections between psychoticism and the three Dark Triad traits performing psychopathy the closer connection and narcissism the smaller. Extraversion reports significant negative connections — although very small— with psychopathy. In addition, and interestingly, the three Dark traits present strong and significant relationships with the sincerity scale of the EPQR-A.

After the correlational analyses, we conducted SEM to avoid, as stated before, measurement error and assure that the connections between the measures taken were specifically as hypothesized and not due to other interactions. The SEM shown in Figure 1, presents quite a good fit (χ^2 = 1102.743, DF =573, RMSEA = .020, SRMR = .051, CFI = .979, GFI = .984, NFI = .958).

After adding the structural paths to the SEM, the sincerity scale from the EPQR-A turns into a predictor of the scores in the Dark Triad, β = .36 for psychopathy, β = .40 for narcissism, but being the highest for Machiavellianism with β = .70. Nevertheless, these are not the only noticeable connections of our path model; both narcissism and Machiavellianism are predicted by neuroticism and extraversion, with a β of .20 and .19 for narcissism and a β of .12 and .10 for Machiavellianism; psychopathy appears to be related to high scores on psychoticism (β = .29), as expected, but low on extraversion (β = -.09).

The ratios of variance accounted for in the Dark Triad scales by the EPQR-A were R^2 = .58 for Machiavellianism, R^2 = .23 for narcissism, and R^2 = .28 for psychopathy (mean, R^2 = .36).
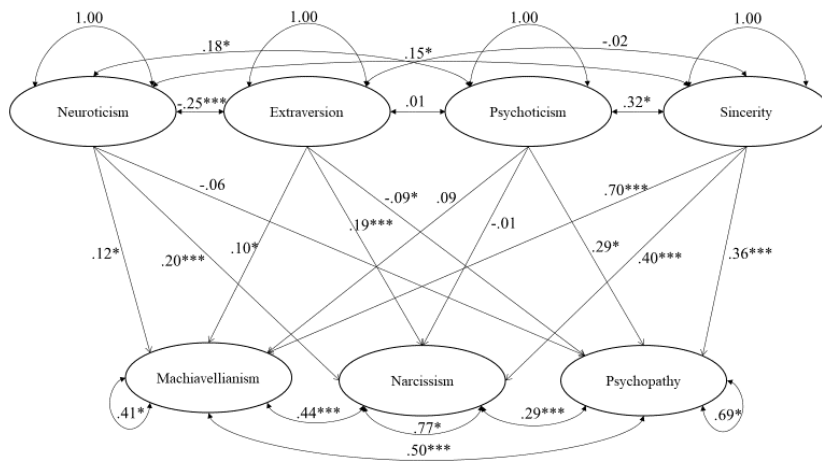
Figure 1. SEM of the EPQR-A predicting the Dark Triad. *p* < .05, ***p* < .001.

Discussion

Although the Three-Factor Theory of Personality (Eysenck & Eysenck, 1975) remains as one of the most important models of personality and it is still used thanks to its simplicity in the traits compared with the Big Five or the HEXACO, there is barely any investigation linking these three supertraits of personality (i.e. extraversion, neuroticism, and psychoticism) with the antisocial model of personality, the Dark Triad composed by Machiavellianism, narcissism, and psychopathy (Paulhus & Williams, 2002).

In this line, even though the PEN model does not capture the whole variance of the Dark Triad, it has shown the following connections between their assessed traits. Machiavellianism presents its main connection with neuroticism, similar results as Mohammadzadeh and Ashouri (2018) that may be explained by the anhedonic and alexithymic moods, characteristics of those people with large scores on Machiavellianism and neuroticism (Cale, 2006; Fehr et al., 1992). Also, as expected (Pineda et al., 2018), people with high scores in narcissism display neurotic personality, probably because of some similar personality tendencies (i.e., high sensitivity to criticism or low tolerance to frustration); moreover, in accordance with Mohammadzadeh and Ashouri (2018), extraversion is also related with narcissism, presumably because of the tendency of those people with high scores in narcissism to show their greatness as well as their necessity to be accepted, going so far as to perform good deeds for others (Cale, 2006; Raskin & Hall, 1981; Trahair et al., 2022). As anticipated, psychopathy was predicted by high scores in psychoticism, which is a normal result due to the similarity of these two constructs (Mohammadzadeh & Ashouri, 2018; Pineda et al., 2018). Although this does not imply a perfect correlation, fueling the discussion about if they are or are not the same construct (Kajonius et al., 2016). Also, even if the relationships are weak or non-significant, the slight tendency in people with bigger scores in psychopathy to be introverted and emotionally stable could be explained by their difficulties to socialize mediated by their lack of interest and ability to understand and share others' feelings, in combination with their usually small anxiety levels (Hare, 1999).

An additional finding of this investigation is the tendency of the Dark Triad personalities to be sincere in their answers or, in other words, to exhibit low social desirability. Partially in line with Kowalski et al. (2018) the results we obtained show that those people with high scores in the Dark Triad traits do not give special importance to the image they project, accepting behaving in ways sometimes considered as socially undesirable. Our findings differ from the results found by Kowalski et al. (2018) in the narcissism trait, while they found a positive association between this trait and the social desirability variable, our results suggest the opposite. This difference as well as the direct association between the other two Dark Triad traits and the sincerity scale might be explained by the nature of the items of the sincerity scale that has been used. Some examples of these items are: "Have you ever taken advantage of another person?" or "Have you ever wanted to help yourself more than to share with others?". These items are developed to assess the acceptance of some antisocial

tendency that is believed to be present in almost everybody, thus presenting some similarities with the items of the Dark Triad.

These results do not run counter to the deceptive nature of the Dark Triad (Baughman et al., 2014). This might be explained by the fact that in this situation, respondents do not obtain any benefit from modifying the image given, which in another situation with such benefits would also imply a distortion in the Dark Triad questionnaire answers. Interestingly, the most related trait to the sincerity scale is Machiavellianism, which is characterized by being associated with the use of manipulative strategies, for example, modifying the answers given in a questionnaire depending on the context (Fehr et al., 1992). Perhaps, in a forensic assessment context, people with high scores on these traits are more likely to be biased in their assessment and appear more socially desirable (Echeburúa et al., 2011; Spaans et al., 2017).

Limitations and Future Directions

One of the limitations of our study is attributed to the instruments used. First, to measure the Dark Triad, which although it presents good reliability coefficients, can be considered as an exploratory or screening measure due to its simplicity. It has also been attacked due to some mismeasurements at the core of the Dark Triad (Kajonius et al., 2016). Hence, the use of other more specific measures for each Dark Triad trait would be ideal.

On the other hand, the sincerity scale of the EPQR-A, might not be optimal for this measurement since it was developed as a validity scale with a significant antisocial burden. Moreover, the reliability values of this scale are low, which is presented as another limitation of this study. Therefore, it would be interesting to further investigate about the sincerity shown in these personalities with different instruments. Furthermore, include sincerity items to generate more objective measures for assessing these traits. Finally, the psychoticism scale also has low internal consistency values, which may also explain why it did not correlate higher with Dark Triad psychopathy.

Conclusion

In conclusion, even though there is extensive research linking the Dark Triad with other models of personality as the Big Five or the HEXACO (Muris et al., 2017; O'Boyle et al., 2015), the relationship between another well-established model of general personality, the PEN model, was not specifically covered. Hence making it relevant to map the links between the Eysenck's model and the Dark Triad, because of the importance of this latest model for predicting antisocial or conflictive behaviours (Muris et al., 2017). And although the supertraits of the PEN model of personality cannot capture the whole variance of the Dark Triad traits, it shows relevant connections.

Finally, the sincere answers given by people with high scores in the Dark Triad traits might have some implications. Taking into consideration the deceptive and manipulative nature of the Dark Triad (Baughman et al., 2014), these results would imply that these traits could be mismeasured in some contexts. Additionally, given these results, the idea is raised that, perhaps, high scores on dark traits lead to these people not giving as much importance to how others see them. It also raises the possible idea that we have only detected people with high scores on dark traits who, in turn, are more sincere. Perhaps people with such traits who are insincere were not detected in this study. Therefore, this suggests that further efforts should be considered to develop more objective measures to assess Dark personalities, such as implicit, indirect, task-based, or forced-choice personality assessments, as well as to include scales measuring social desirability in self-reported assessments (e.g., Fronczyk and Witkowska, 2020; Santacreu & Hernández, 2018).

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Appendix 2

Study 2

Civic Engagement and Personality: Associations with the Big Five and the Dark Triad

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Civic Engagement and Personality: Associations with the Big Five and the Dark Triad

Abstract

Several studies have analyzed the relationship between general personality traits and attitudes and behaviors, indicating that a person is more committed to the community. After raising the question of whether malevolent traits might also be related, the aim was to analyze the relationship between civic engagement and personality, delving into the contribution of the Dark Triad (narcissism, Machiavellianism, and psychopathy) and controlling for the association with the Big Five. The Civic Engagement Questionnaire, the Short Dark Triad, and the Big Five Inventory-10 were administered to 1175 Spanish students (convenience sampling). After performing statistical analyses using SPSS statistical software, it was obtained that the three Dark Triad traits explained 11% of the total explained variance of civic engagement, while 19% was reached when the Big Five were included. Narcissism and openness were the factors most strongly associated with engagement. The positive relationship between narcissism and general personality traits could explain why narcissistic people have more favorable attitudes. Furthermore, people with narcissistic traits may display these attitudes for their own benefit. This study provides further evidence of how the narcissistic personality trait differs from the other two malevolent traits. Given that these traits are also associated with maladaptive behaviors, knowing all their characteristics could facilitate the design of prevention programs aimed at reducing such maladaptive behaviors.

Keywords: Dark Triad; Big Five; civic engagement; personality; narcissism

1. Introduction

Civic engagement is the attitude of believing that one can and should make a difference for the betterment of the community, requiring knowledge, attitudes, skills, and values to achieve that betterment [1,2]. It consists of promoting the quality of life of a community through civic behaviors (considering both political and non-political processes, given their relationship), which in turn has positive effects on citizens' sense of community and their attachment to their place of residence [1–4].

The different authors who have considered civic engagement in their studies have done so from different approaches, analyzing it in a more specific way and asking about certain behaviors (for example, asking whether they pay taxes and vote in elections) or in a more general way (for example, asking whether they are committed to serving in their community) (e.g., [5–7]). These civic behaviors have been positively related to mental and physical health and well-being in people who engage in them, and, in turn, the sense of community has been related to social well-being [8–10].

Several studies have analyzed its relationship to broader personality traits to identify the main characteristics that are related to community engagement. The interest has been in analyzing which general traits are related to those attitudes and behaviors that indicate that a person is more engaged in their community [6,11–15]. On this matter, different studies have focused on the Big Five personality traits [16] and, to a lesser extent, the Big Six personality traits (HEXACO; [17]). These constructs include extraversion, agreeableness, conscientiousness, openness to experience, emotional stability (or neuroticism in the negative sense), and honesty–humility (the latter present only in the HEXACO).

Overall, there does not seem to be a consensus on which traits are related to civic engagement, as different relationships have been obtained in each study and the same traits are not always positively associated [6,11–15]. For example, some find positive relationships with all traits [11], and others find relationships with all traits except emotional stability [15], conscientiousness [12], or openness to experience [6]. Other studies, on the other hand, only find relationships with extraversion [14].

A cross-sectional study in 24 countries that examined the association of personality with political and civic participation found that the effects of the Big Five vary considerably across countries and that the results also depend on exactly which variables are measured. Furthermore, they consider that the effects of the Big Five on participation may also be mediated or moderated by other variables yet to be studied [7]. Perhaps, for this reason, different relationships were obtained in the studies mentioned above.

The question of the relationship between civic participation and malevolent (or socially undesirable) personality traits remains. Are there people who, despite having malevolent traits, are also committed to their community? So far, only one study has been located that has analyzed the relationship between attitudes towards good citizenship and civic duty (being a good citizen) and malevolent traits. This is the study by Pruysers et al. [6], who set out to extend the analysis beyond general personality traits to include dark traits. To do so, using a cross-sectional analysis (with regression models), they considered in their analyses both general traits (HEXACO), and Dark Triad traits in a sample of 371 Canadians (Mage = 49.20; SD = 15.20; 58% female).

The Dark Triad was defined in [18] by Paulhus and Williams and is composed of three malevolent personality traits: subclinical narcissism, Machiavellianism, and subclinical psychopathy. Broadly speaking, narcissism refers especially to grandiose identity and the need for admiration; Machiavellianism to lack of morality and manipulation of others; and psychopathy to callousness and impulsivity [19].

Therefore, considering these three traits and their relationship with civic engagement, Pruysers et al. [6] obtained statistically significant relationships for both narcissism and psychopathy, in a positive sense in the first case and in a negative sense in the second. Thus, they found that people with narcissistic traits are more engaged in the community, while people with psychopathy traits are less likely to be engaged. They did not find a significant relationship with respect to Machiavellianism.

These results, which indicate that people with narcissistic traits do actively engage with citizenship, question the meaning of narcissism since it is considered a malevolent or "dark"

personality trait. In addition, the relationship between narcissism and other characteristics considered socially desirable, such as well-being or emotional intelligence, has also been examined and positive relationships have been found [20–27].

These relationships are interesting because it is important not to forget that Dark Triad traits have been associated with a wide variety of violent behaviors (bullying, sextortion, intimate partner violence, and cyberviolence or general delinquency, among others) [28–33]. Therefore, it is interesting to analyze why people with narcissistic traits do engage with their community. Pruysers and colleagues [6], for example, consider that people with narcissistic traits may seek praise and admiration from others and therefore perform these good deeds. In addition, it is well known that people with narcissistic traits constantly seek to boost their self-esteem and ego, characteristics that, in turn, overlap with other healthy characteristics in people, such as mental strength and lower stress levels, resilience, or be perceived as a good leader [34–36].

Taking these results into account, the recent interest of many authors has been in finding an answer to why narcissism behaves differently from the other two malevolent traits (Machiavellianism and psychopathy). For example, Van Groning et al. [22] consider that the presence of other traits or skills (considered socially desirable) confers on narcissism the characteristic of being a protective factor concerning the rest of the traits of the Dark Triad. Based on this idea, the positive relationship between civic engagement and subclinical narcissism could be explained by following this argument and considering that narcissism is at the same time correlated with other more general personality traits, even though some studies have concluded that the inclusion of the Dark Triad personality traits does not offer real predictive advantages over the HEXACO, which contemplates the honesty–humility variable [37–39].

However, following Weinschenk's indications [7], the effect of the Big Five on civic engagement could also be influenced by other unknown variables. Furthermore, it is well known that narcissism is positively associated with some of the Big Five factors, generally, with extraversion, conscientiousness, or openness to experience, and negatively with the other two (i.e., with neuroticism and agreeableness). Moreover, these associations are somewhat different in comparison with the other two traits of the Dark Triad, i.e., Machiavellianism and psychopathy, since, in general, these seem to relate positively to neuroticism and negatively to conscientiousness, openness to experience, and agreeableness. In the case of extraversion, Machiavellianism seems to relate negatively and psychopathy positively [40–47]. Following this idea, the study by Pruysers et al. [6] is the only one located that has analyzed the relationship of civic engagement with both the traits considered to be more general and the traits considered to be more socially undesirable. However, there are no studies with any population, that have analyzed these relationships together, that is, that have considered in a single statistical model the associations of both general and malevolent traits with civic engagement. Therefore, no studies have considered the possible differences between the association with malevolent traits when they do so alone and when they do so together with more general traits. Moreover, Pruysers and colleagues concluded that further studies are needed to be able to generalize the results they obtained in their analyses with confidence since they were the first to look at the relationship between civic engagement and dark personality traits.

The Present Study

As stated, there are currently no studies that have analyzed the relationship between civic engagement and personality traits, both general and malevolent, and that have considered analyzing the possible relation of some traits with others in determining this engagement (on the assumption that some are malevolent and should not be related to civic engagement).

Considering the few results in the literature and the controversy with the narcissistic trait, our main concern is to know the association of malevolent traits with civic commitment and to know if there are differences between the association with malevolent traits when they are the only traits included in the statistical model and when they are included together with the more general traits. Therefore, based on these ideas, this paper aimed to analyze the relationship between civic engagement and personality traits, delving into the specific contribution of the Dark Triad traits and controlling for the association with the Big Five personality traits in a sample of Spanish young adults.

Consistent with previous literature [6], we expect to obtain a significant association between civic engagement and narcissism and psychopathy (positive in the first case and negative in the second case), and to obtain a non-significant association with Machiavellianism (H1). In turn, taking into account the inconsistency of the literature and the difficulty in establishing a hypothesis [6,11–15], a significant association is expected between civic engagement and the Big Five traits (positive for all except neuroticism, which is expected to be negative) (H2). Finally, we expect to obtain differences in the magnitudes of association with civic engagement when malevolent traits are associated alone and when they are associated with more general personality traits (i.e., when they are included together in the same statistical model) (H3). The latter hypothesis is not supported by previous literature, as this is the first study to raise this question.

2. Materials and Methods

2.1. Sample

The sample consisted of 1175 students (683 females, 58.1%) from two Spanish universities (Miguel Hernandez University of Elche and San Antonio Catholic University of Murcia). The mean age was 20.51 years (SD = 2.52, range 17–30 years).

To determine the sample size (convenience sampling), we allocated several observations 6 to 10 times greater than the variables [48]. Accordingly, the sample needed size ranged between 264 and 440 participants, based on the number of items of the Civic Engagement Questionnaire, Big Five Personality Traits-10, and the Dark Triad. Finally, 1733 participants took part in the study. However, 558 cases had to be eliminated because they had not completed the online survey until the end. Therefore, in the end, the sample consisted of 1175 participants.

2.2. Measures

2.2.1. Civic Engagement Questionnaire (CEQ)

The CEQ [49] is a subscale developed from the Positive Youth Development Inventory (PYDI; [50]). Based on seven items, it generally measures young people's perception of their contribution to the community (e.g., it is important to me to try to do something to change the world or I like to work with others to solve problems). A six-point Likert-type scale from 1 = strongly disagree to 6 = strongly agree was used. In the present sample, it shows an adequate reliability index, with an acceptable alpha (Cronbach's alpha = 0.78 and McDonald's omega = 0.79), like that obtained in the original version.

2.2.2. Big Five Inventory-10 (BFI-10)

The BFI-10 [51] is a shortened version of the 44-item BFI and measures the Big Five personality traits: extraversion (e.g., I see myself as someone who is outgoing, sociable), agreeableness (e.g., I see myself as someone who generally trusts others), conscientiousness (e.g., I see myself as someone who does a thorough job), openness to experience (e.g., I see myself as someone who has an active imagination), and neuroticism (e.g., I see myself as someone who gets nervous easily). Each factor contains two items and is answered on a 6-point Likert-type scale (from 1 = strongly disagree to 6 = strongly agree). The design of this instrument proved that the BFI-10 retains a substantial part of the reliability and validity of the BFI-44 [52]: good test–retest reliability, convergent validity with another scale (NEO-Personality Inventory-Revised; [53]), and external validity. For the present sample, the correlation between the items of each factor (obtained with Pearson's correlational analysis) is as follows: extraversion = 0.66, agreeableness = 0.03, conscientiousness = 0.21, openness to experience = 0.31, and neuroticism = 0.50.

2.2.3. Short Dark Triad (SD3)

The SD3 [19] is a 27-item self-report that measures the following malevolent personality traits of the Dark Triad: subclinical narcissism (e.g., people see me as a natural leader), Machiavellianism (e.g., make sure your plans benefit you, not others), and subclinical psychopathy (e.g., revenge must be swift and unpleasant). Each factor contains nine items and is answered on a Likert-type scale from 0 = strongly disagree to 4 = strongly agree. It has been validated with a Spanish sample and has presented adequate reliability indices in the present sample with an acceptable alpha (Cronbach's alpha: narcissism = 0.64, Machiavellianism = 0.79, and psychopathy = 0.67), similar to that reported by the authors [54]. It also has an acceptable omega (McDonald's omega: narcissism = 0.65; Machiavellianism = 0.79, and psychopathy = 0.71).

2.3. Procedure

Participants were recruited through institutional outreach and the survey was carried out using the online data collection platform DetectaWeb [55] during the months of October, November, December, and January of the 2017/2018 academic year. To carry out the study, the project received approval from the university's ethics committee (Reference DPS.JPR.03.17) and followed the ethical standards outlined in the 1964 Declaration of Helsinki. All participants gave their consent to participate in the study.

When participants accessed the survey link from their cell phones, tablets, or computers, they were first shown the instructions, then asked for their consent to participate, and then filled in the different scales of the study, for which they needed approximately 20 min. Participants did not receive compensation for participating in the study.

At the time of the project, many more questionnaires were administered than those used for this study. We administered measures for mental and socioemotional health, positive and negative affect, level of distress, anxiety, and depression, emotional intelligence, avoidance and fusion, suicidality, internalizing and externalizing symptoms and prosocial behavior, self-esteem, quality of life, healthy behaviors, and sincerity. However, only variables measuring civic engagement, the dark triad, and the Big Five were considered as variables of interest for this study. Consequently, the present study was part of a larger study in which all the measures described above were tested.

2.4. Desing

A cross-sectional study (descriptive-correlational) was designed for the study. First, the descriptive statistics and the scores of the sample in the different questionnaires administered were calculated to obtain the profile of the participants and the mean of the different scores. The internal consistencies of the Civic Engagement Questionnaire and the Short Dark Triad were also estimated by calculating Cronbach's alpha and McDonald's omega coefficients following the recommendations of Kalkbrenner [56] for instrument reliability.

Secondly, to test the first two hypotheses of the study (H1 and H2), the correlations between the different variables under study were calculated to delimit the magnitudes and the positive or negative direction of the relationships between the different variables. For this same purpose, a multiple regression analysis was conducted to determine the associations of both dark traits and general personality traits with civic engagement (criterion variable). For this purpose, and to test H3, first, the specific contribution of gender as a sociodemographic variable (first block) was considered. Age was not included in the model due to the small variance in the sample (limited range of 17 to 30), anticipating that its effect would be null; in the second block the three Dark Triad traits were considered; and in the third block, the Big Five personality traits were considered. The percentage of total variance explained (sr^2) for each of the variables was also calculated.

Given the large sample size, correlations and magnitudes of association in the regression model were interpreted after Bonferroni correction to obtain more accurate results (a significant effect was $p < 0.0056$, because of dividing the alpha (0.05) by the number of analyses performed, i.e., nine). Data were analyzed using SPSS (The Software IBM SPSS, 2021) and Jamovi (The jamovi project, 2021) statistical software. This study's design and its analysis were not pre-registered.

The Spanish version of the Big Five Inventory-10 and Civic Engagement Questionnaire were adapted into the Spanish language in accordance with the guidelines of the International Test Commission [57], using an iterative-translation method that began with several independent translations. The item translations were then reviewed by a joint committee of translators with knowledge of the Spanish language and culture and specialists in the field of psychological assessment who analyzed the adequacy of the adapted version. To be sure that all items were well understood for young people, interviews asking about comprehension of the items were performed.

3. Results

3.1. Descriptive Statistics of the Instruments

The descriptive statistics of the instruments are presented in Table 1. In relation to the civic engagement, the mean score is moderately high. For the three dark traits (Dark Triad) participants seem to score higher on narcissism and Machiavellianism, and in the case of the Big Five scores, these are quite similar across the different factors, but they score higher on openness to experience.

3.2. Correlations between Civic Engagement, Dark Triad Traits, and the Big Five Personality Traits

The correlations (with the Bonferroni fit) between the different variables of interest for testing the first two hypotheses of the study (H1 and H2) are presented in Table 2. Civic engagement correlates significantly with two of the Dark Triad traits: narcissism and Machiavellianism. However, in the case of narcissism, it correlates positively and in the case of Machiavellianism it correlates negatively. In turn, civic engagement is significantly positively related to four of the Big Five personality traits: extraversion, agreeableness, conscientiousness, and openness to experience. In the case of neuroticism, the relationship is negative, but also significant.

Table 1. Means and Standard Deviations for Civic Engagement, Dark Triad, and Big Five.

	Total ($N = 1175$)		
	Range of Scores	M	SD
Civic engagement	7–42	31.68	5.43
Big Five			
Extraversion	2–12	7.37	2.78
Agreeableness	2–12	7.96	2.06
Conscientiousness	2–12	7.54	2.10
Openness to experience	2–12	8.72	2.31
Neuroticism	2–12	7.07	2.57
Dark Triad			
Narcissism	0–36	15.11	5.28
Machiavellianism	0–36	16.77	6.60
Psychopathy	0–36	9.13	5.54

Table 2. Bivariate Correlations Among Study Variables.

	Civic Engagement	Extraversion	Agreeableness	Conscientiousness	Openness to Experience	Neuroticism
Civic engagement		0.22*	0.14*	0.23*	0.28*	−0.09*
Narcissism	0.25*	0.40*	−0.09*	0.14*	0.15*	−0.15*
Machiavellianism	−0.11*	−0.05	−0.29*	−0.06	−0.05	−0.01
Psychopathy	−0.08	0.06	−0.22*	−0.09*	0.01	0.06

Note. * $p < 0.0056$ (Bonferroni fit).

The relationship between the Dark Triad traits and the Big Five is more heterogeneous. Narcissism correlates significantly with all five traits, but positively with extraversion, conscientiousness, and openness to experience, and negatively with agreeableness and neuroticism. Psychopathy is only significantly and negatively related to agreeableness and conscientiousness, and Machiavellianism is negatively related only to agreeableness.

3.3. Associations between Civic Engagement, Dark Triad Traits, and the Big Five Personality Traits

The regression model (with the Bonferroni fit) testing the three hypotheses of the study is presented in Table 3. In relation to the socio-demographic variable (gender; first block), a null contribution (0%) of the total explained variance of civic engagement was observed. However, when the three traits of the Dark Triad were included in the model (second block), a contribution of 11% ($p < 0.001$) was observed, which reached 19% ($p < 0.001$) when the Big Five were included as a third step (third block).

More specifically, in the second block, all three dark traits were found to be significantly associated with civic engagement ($p < 0.0056$, Bonferroni fit), but when the Big Five were introduced into the model, only narcissism remained significant (positive relation). In turn, of the Big Five, only agreeableness, conscientiousness, and openness to experience presented a significant (and positive) association ($p < 0.0056$, Bonferroni fit). In that third block (with all traits included in the model), it was observed that of the Dark Triad traits, narcissism was the factor with the highest specific contribution ($sr^2 = 3.42\%$). In the case of the Big Five, openness to experience was the factor with the highest specific contribution ($sr^2 = 4.37\%$).

4. Discussion

This study started from the question of whether people with malevolent traits were also engaged in the community and, having looked at the results of the only localized study that had analyzed these relationships [6], asked why people with narcissistic traits did appear to have civic

behavios (as opposed to the other two malevolent traits). Furthermore, considering the possible influence of other variables on these relationships [7,22], the possibility was raised that the Big Five might modify these relationships. Therefore, the aim of this study was to analyze the relationship between civic engagement and personality traits, delving into the specific contribution of the Dark Triad traits and controlling for the association with the Big Five personality traits in a sample of Spanish young adults.

Table 3. Associations between civic engagement, Dark Triad traits, and the Big Five personality traits.

CV	PV	Block 1				Block 2				Block 3			
		β	t	$r_{x,y}$	sr^2	β	t	$r_{x,y}$	sr^2	β	t	$r_{x,y}$	sr^2
	Ge	.01	0.34	.01	0.01%	.02	0.80	.02	0.05%	.03	1.06	.03	0.08%
	N					.35	11.45*	.32	9.92%	.23	7.05*	.19	3.42%
	M					-.16	-4.78*	-.13	1.74%	-.09	-2.69	-0.07	0.49%
	P					-.11	-3.21*	-.09	0.77%	-.07	-2.14	-.06	0.31%
	E									.06	2.09	.06	0.30%
CE	A									.10	3.61*	.10	0.90%
	C									.15	5.38*	.14	1.99%
	O									.22	7.99*	.21	4.37%
	N									-.07	-2.42	-.06	0.40%
	R^2		.01				.11				.19		
	F		0.12				36.83*				32.48*		

Note. CV = Criterion variable; PV = Predictor variable; CE = Civic engagement; G = Gender; N = Narcissism; M = Machiavellianism; P = Psychopathy; E = Extraversion; E = Agreeableness; C = Conscientiousness; O = Openness to experience; NE = Neuroticism; *$p < 0.0056$ (Bonferroni fit).

Firstly, descriptive analyses have shown that the participants' scores on the different questionnaires are within the mean compared to other studies [8,30,52,54]. Moreover, considering the ranges of the different scales, the scores are neither too high nor too low.

Secondly, to test the first two hypotheses of the study (H1 and H2), a correlational analysis and a regression model were conducted to test the associations between civic engagement and personality traits, both general and malevolent. The results showed the null association of the socio-demographic variable of gender with civic engagement, contrary to what was found in previous studies [6,11,12]. This could be due to differences in the characteristics of the samples in terms of culture and age (in the present sample, the average age is lower than in the other studies: 20.51 versus 50), although Doolittle and Faul [5] pointed out in their study that there is no theoretical basis to support the idea that age and gender influence civic attitudes.

On the one hand, in relation to the three traits of the Dark Triad, the (positive) association of civic engagement with narcissism stands out, being weaker than the (negative) association with Machiavellianism and psychopathy, when only the Dark Triad is included in the model. Thus, H1 is only partially confirmed, since we expected to obtain significant associations only with narcissism (positive) and psychopathy (negative) and, therefore, a non-significant association with Machiavellianism.

These results do not coincide with those obtained in the only localized study that has analyzed these associations using a regression model, since that study did not obtain a relationship with Machiavellianism [6]: Pruysers et al. considered that the motivations and interests that citizens have to engage with their community should perhaps be considered. Therefore, the different way of measuring civic engagement could have led to this difference in the results. These authors also highlight the importance of interpreting the results within the cultural context.

On the other hand, in relation to the Big Five traits, the association of civic engagement with openness to experience is the most prominent, being the trait with the highest association compared to agreeableness and conscientiousness (with no association with extraversion and neuroticism). In

this case, H2 is also only partially accepted, as we expected to obtain significant associations with all five traits (positive for all except neuroticism), but civic engagement was only significantly (and positively) associated with three of the traits (i.e., agreeableness, conscientiousness, and openness to experience).

These results do not coincide with those obtained in previous literature, since no study has obtained the same associations with the same traits [6,11–15]. However, several studies have obtained positive associations with openness to experience, agreeableness, and conscientiousness (e.g., [11,15]). In the same way, there are also some studies that have not obtained associations with neuroticism [15], but all the articles already cited have obtained relationships with extraversion.

It is important to note that in the present study, the associations between civic engagement and the Big Five were also controlled for the association with the Dark Triad, which may have led to this discrepancy with the results of previous studies [7]. In addition, the correlations in this study did show significant relationships with the five traits, consistent with previous literature, e.g., [11]. Moreover, each study seems to look at civic engagement in less or more depth (asking more generally whether they are committed to the community or asking about more specific behaviors, such as voting, following the rules, participating in associations, etc.) and depending on this specificity level, different relationships have been obtained [6,11–15]. In our case, the questions were more general, which could cause participants to respond in more general terms, knowing that they do engage with their community by engaging in certain behaviors, but not others. Consequently, our results could be somewhat general.

Third, the regression model allowed us to test the last hypothesis of the paper (H3). In this case, H3 is accepted, since it was expected to obtain differences in the magnitudes of association with civic engagement when malevolent traits are associated alone and when they are associated with more general personality traits, and this is what was obtained. The contribution of all traits together (the Dark Triad together with the Big Five) being greater for civic engagement. Furthermore, when the Big Five are included in the model, the association with Machiavellianism and psychopathy is null and only narcissism (from the Dark Triad traits) is associated (and positively) with civic engagement. The association with the three dark traits is greater when they do so without the contribution of the Big Five.

These latter results cannot be compared with previous literature since this is the first study to analyze the association between civic engagement and personality in the same regression model, i.e., both the more general and the more malevolent traits. Perhaps, as Weinschenk [7] says, the association between some traits and others could explain the differences exposed in this work. However, it is important to consider that some authors consider the bias (in multivariate analyses) in the interpretations of the results problematic and some studies have concluded that the inclusion of the Dark Triad personality traits does not offer real predictive advantages over the HEXACO personality model, which contemplates the honesty–humility variable [37–39].

It is important to highlight the association obtained between civic engagement and narcissism (different from that obtained with the other two malevolent traits of the Dark Triad), as the results point to the fact that people with narcissistic traits do seem to engage with their community. Again, these results may be explained by the association between some traits and others, that is, by the relationship with general personality traits [7]. Moreover, the relationship between narcissism and the general traits has already been tested and in this study the same relationships have been found as in previous literature, i.e., positive relationships with extraversion, openness to experience, and conscientiousness, and negative ones with neuroticism and agreeableness [40–47].

These findings agree with the ones reported by Van Groningen et al. [22]. In their study, they concluded that, perhaps, general traits could be conferring narcissism the characteristic of being a protective factor with respect to the rest of the traits of the Dark Triad. However, it is important to mention the weak, albeit significant, correlation between narcissism and agreeableness, contrary to that found in previous literature (stronger correlation). This finding could be since the SD3 mainly measures the agentic components of narcissism, and not the antagonistic and vulnerable components, and it is likely that it is this agentic narcissism that correlates with civic engagement. Future research could explore this further [45,47,58].

These results highlight the need to study the subclinical narcissistic personality trait included in the Dark Triad. As with previous studies, this trait, despite being considered a malevolent personality trait, maintains a positive relationship with other variables considered socially desirable, such as emotional intelligence and well-being [21–27].

Another possible explanation for the relationship between civic engagement and narcissism is the one pointed out by Pruysers and colleagues [6]. They consider that people with narcissistic traits may seek praise and admiration from others and therefore perform good deeds (and thus perhaps also exhibit other desirable characteristics such as those mentioned above) [24,26,27].

Moreover, it is well known that people with narcissistic traits constantly need to boost their self-esteem and ego [18,59–61] and the positive relationship between having high collective self-esteem and participating in the community has also been seen [62]. Therefore, these people could perform these good acts, but without becoming excessively sympathetic and generous to others, which could explain the negative relationship obtained in this study and in previous literature (null in some studies) between narcissism and trait agreeableness [41,44,46].

Limitations and Future Lines of Research

A possible limitation of this study is the difficulty in generalizing the results in terms of civic engagement. As has already been mentioned, depending on how this concept is treated (whether in a more general or more specific way), the results may vary and stronger or weaker relationships with other variables may be obtained. Therefore, as a future line of research, it might be interesting to compare these results using another questionnaire that measures civic engagement more specifically.

Another possible limitation of this study is that no internal consistency calculation is available for the instrument used to assess the Big Five personality traits, and the correlation between the two items of some of the factors in the present sample, especially of the agreeableness factor, is very low. Similarly, Cronbach's alpha in the case of narcissism and psychopathy is not too high, which could indicate certain reliability problems.

A final limitation is, being a cross-sectional study, there is difficulty in generalizing the results and in establishing causality between variables. As a future line of research, we propose to analyze longitudinally the associations between civic engagement and general and malevolent personality traits.

5. Conclusions

This is the first study to jointly analyze (in the same regression model) the association of malevolent personality traits (Dark Triad) and the Big Five with civic engagement. It highlights, on the one hand, that the Dark Triad traits do associate with civic engagement, and, on the other hand, it highlights the specific contribution of narcissism and openness to experience (both positively associated). Following the indications of Van Groning [22] and Weinschenk [7], the positive relationship between narcissism and general personality traits could explain why people with narcissistic traits have a more favorable attitude towards civic behaviors, which points to a greater tendency towards good citizenship and greater civic engagement with their community.

However, it is important not to forget that these dark traits have been linked to a wide variety of violent behaviors (bullying, sextortion, intimate partner violence, and cyber violence or general delinquency, among others) [28–33], so perhaps, people with narcissistic traits perform civic behaviors in order to obtain their own benefits and reinforce their self-esteem [18,59–61]. In addition, it seems that people are more likely to participate in collective actions when these are related to their own interests [63].

This study provides further evidence of how the narcissistic personality trait differs from the other two malevolent traits that make up the Dark Triad. Given that these traits are also associated with maladaptive behaviors, as just discussed, knowing all the characteristics of these malevolent traits could facilitate the design of prevention programs aimed at reducing such maladaptive behaviors.

As future lines of research, we suggest the need to continue investigating the subclinical narcissistic trait, since it could be considered as a factor of self-protection against the other two traits of the Dark Triad (Machiavellianism and psychopathy). In addition, future research could further investigate the question of whether people with narcissistic traits are more likely to participate in collective actions because they seek their own benefits. In general, further analysis of all the

relationships discussed in this study and establishing the causality of the different variables is encouraged.

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Study 3

The connection between Dark Triad and Emotional Intelligence traits: A multi-study person-centred approach

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The connection between Dark Triad and Emotional Intelligence traits: A multi-study person-centred approach

Abstract

The idea of the possible dark side of Emotional Intelligence (EI) has emerged. The objective was to identify latent profiles with Dark Triad traits and EI, and to examine their differences. The SD3, the TEIQue-SF and other measures were administered to 1241 Spaniards. One profile was identified with low Dark Triad and EI, another with high Dark Triad and low-medium EI, and another with low Machiavellianism and psychopathy, medium-high narcissism and high EI (with higher positive characteristics). Perhaps there is an EI profile with narcissistic traits that can maximize personal benefit and influence others. It is relevant to the design of emotional education programs, as making EI skills available to people with prominence toward dark traits may not be advisable.

Keywords: Emotional Intelligence; Dark Triad; narcissism, Latent Profile Analysis; personality

Introduction

Emotional Intelligence (hereinafter EI) which has received much attention over the years has been broadly defined as the ability to manage and regulate one's own and others' emotions to solve problems and regulate behaviour (Goleman, 1995; Salovey & Mayer, 1990). People with high EI traits appear to identify emotional expressions more quickly and are more sensitive to inducing emotions in others (Petrides, 2001).

Petrides et al. (2007) demonstrated that EI is a composite personality construct and, after several studies, concluded that it has a clear and replicable structure comprising four distinct and interrelated (self-perceived) dimensions: emotionality, sociability, well-being, and self-control (Petrides, 2009a; Petrides & Furnham, 2001). People with high emotionality scores are defined as "people who are in touch with their own and others' feelings. They can perceive and express emotions and use these qualities to develop and maintain close relationships with others". In the case of sociability, they are defined as "people who are good at handling social interactions. They are good listeners and can communicate clearly and confidently". People with high well-being scores are defined as "people who feel positive, happy and fulfilled". Finally, in the case of self-control, they are defined as "people with a healthy degree of control over their impulses and desires and are good at regulating external pressures and stress" (Petrides, 2009a; Petrides, 2009b).

Several studies have shown the relationship between EI and a wide range of positive constructs or characteristics, such as happiness, life satisfaction, social support, positive affect, resilience, self-esteem, job satisfaction, psychological strengths, or mental health (Acosta & Clavero, 2019; Calero et al., 2018; Kong et al., 2019; Miao et al., 2017; Piqueras et al., 2020; Poulou, 2014; Trigueros et al., 2020). However, the current interest lies not only in knowing the positive side of people with EI, but also in exploring whether there is a dark side in EI (Gentina et al., 2018; Kilduff et al., 2010; Wood, 2020). Thus, a systematic review concluded that high levels of EI can also have negative effects on oneself, such as poorer psychological health or reactivity to stress, and on others, such as manipulative or antisocial behaviour (Davis & Nichols, 2016). It has been questioned whether people with high EI may manifest emotionally manipulative behaviours to achieve goals for their own benefit, displaying certain emotions that maximise personal gain and shaping the emotions of others (Kilduff et al., 2010). An example of this is the result obtained by Greenfield and collaborators (2021) in his study, which showed that sexual sadism was positively associated with strategic EI (ability to manage and understand emotions).

To empirically test the possible dark side of people with high EI, different authors have focused their research on analysing the relationship between EI and dark personality traits, more specifically, Dark Triad personality traits (Hjalmarsson & Dåderman, 2020; Hyde et al., 2020; Miao et al., 2017). This interest has stemmed from concerns about whether high EI might enable people to be manipulative and selfish, since the positive correlation between Dark Triad traits and emotional manipulation has already been evidenced (e. g., Hyde et al., 2020; Nagler et al., 2014). The Dark Triad (Paulhus & Williams, 2002) is a construct that encompasses three negative personality traits: subclinical narcissism, Machiavellianism, and subclinical psychopathy. The first of these refers to people with feelings of self-importance and grandiosity; the second to people with a tendency to manipulate others and lacking in morality; and the third to impulsive and insensitive people (Jones & Paulhus, 2014).

Thus, different studies have analysed these relationships in the general population, in many cases starting from the idea that EI is beneficial for individuals and should not be related to any of the traits of the Dark Triad. However, while they have found that EI is negatively related (or unrelated) to Machiavellianism and psychopathy, they have found positive relationships with narcissism (Hjalmarsson & Dåderman, 2020; Hyde et al., 2020; Nagler et al., 2014; Petrides et al., 2011; Plouffe et al., 2017; Schreyer et al., 2021; Szabó, 2019; Szabó & Bereczkei, 2017; Veselka et al., 2012; Zhang et al., 2015). However, several systematic reviews in recent years have concluded that either there is no positive relationship between any of the Dark Triad traits and EI or that there is a positive weak relationship with narcissism (Miao et al., 2017; Michels & Schulze, 2021; Walker et al., 2021). Overall, they consider that there is not enough support to consider a dark side of this construct. Therefore, looking at all these results, there is still debate about the relationship with narcissism and the influence of this trait on EI.

Another important question in this field is why there is such a possible positive relationship between EI and narcissism. Looking at the conclusions reached by studies that obtain these relationships, most of them consider that it could be due to several reasons: the need of people with high narcissistic traits to maintain the grandiose view of themselves, their tendency to exhibit prosocial behaviours, the fact that they are also optimistic, likeable and popular, their high self-esteem and self-worth (which may lead to overestimate their own abilities), or low levels of personal distress (e.g., Nagler et al., 2014; Szabó, 2019; Veselka et al., 2012). Moreover, different authors have already considered the narcissistic trait to be the "bright member" of the Dark Triad and that it could be a protective factor with respect to the other two traits of this construct (Machiavellianism and psychopathy) (Nagler et al., 2014; Van Groningen et al., 2021). These findings are based on evidence that this trait correlates positively with different traits that are also considered positive, such as well-being, civic engagement or psychological strengths (Papageorgiou et al., 2020; Rico-Bordera et al., 2021; Womick et al., 2020); and negatively (or unrelated) with some traits considered negative, such as psychological difficulties or psychopathology (as opposed to Machiavellianism and psychopathy) (Papageorgiou et al., 2017, 2019, 2020; Stead et al., 2012).

The present study

It is important to note that people with high EI show less aggressive behaviour (e. g., Inglés et al., 2021; Vega et al., 2021). However, given the positive relationship between Dark Triad traits and a wide variety of violent behaviours, such as bullying, sexting, intimate partner violence, and cyber-violence or delinquency (e. g., Alsheikh Ali, 2020; Carton & Egan, 2017; Hayes et al., 2021; Pineda, Galán et al., 2021; Pineda, Martínez-Martínez, 2021; Pineda, Rico-Bordera, 2021), scientific community still wonder whether it is possible that there are people with high dark traits and high EI who are, for example, emotional manipulators. That is, scientific community continue to wonder whether there is a dark EI, and whether there are people with narcissistic traits, EI and who, in turn, have characteristics such as those discussed above (such as high self-esteem, prosocial behaviours or low levels of personal distress).

Therefore, the aim of this study was to identify latent profiles based on the Dark Triad traits and EI factors proposed by Petrides (2009a) in Spanish emerging adults. Furthermore, we aimed to examine the differences between the profiles found, considering two types of variables: the variables that different authors proposed as possible explanations for the positive relationship between narcissism and EI (self-esteem, prosocial behaviours and low levels of personal distress); the variables that we know to be related to EI and narcissism positively (well-being, civic engagement and psychological strengths) and negatively (psychological difficulties-psychopathology).

Attending to the inconsistent results in the previous literature, we expect to find a profile with high Dark Triad traits and low EI (H1), a profile with low Dark Triad traits and high EI (H2), and a profile with low Machiavellianism and psychopathy, high narcissism, and high EI (H3). It is also expected to find differences in the profiles obtained regarding the other variables of interest, finding that the profile with low Machiavellianism and psychopathy, and high narcissism and high EI, will obtain scores in the positive variables and lower in the negative ones (H4).

Method

Participants

The sample consisted of 1241 Spanish emerging adults (719 female, 57,9%) of different degrees and academic years from two universities in eastern Spain (X and X). The mean age was 20.51 years (SD = 2.51, range 17–30 years).

Measures

Short Dark Triad (SD3; Jones & Paulhus, 2014)

The SD3 is a 27-item self-report that measures the three personality traits of the Dark Triad: subclinical narcissism, Machiavellianism, and subclinical psychopathy. The 27 items are distributed in 9 items per factor, which are answered on a Likert scale from 0 = *strongly disagree* to 4 = *strongly agree*. The instrument used was the Spanish version of the SD3 which has been previously validated and has demonstrated good reliability, with an acceptable alpha (Cronbach's alpha: subclinical narcissism = .61; Machiavellianism = .73 and subclinical psychopathy = .68) (Pineda et al., 2020).

Trait Emotional Intelligence Questionnaire-Short Form (TEIQue-SF; Petrides, 2009a)

The TEIQue-SF is a self-report that measures both total Emotional Intelligence and its four subscales: emotionality, self-control, sociability, and wellbeing. It contains 30 items that are answered on a 7-point Likert-type scale (from 1 = *strongly disagree* to 7 = *strongly agree*). The Spanish version of this short version was the instrument used. It has previously showed an excellent fit to the theoretical four-factor structure ($\chi^2(2) = 6.29$, $p = .002$, CFI = .99, TLI = .98, IFI = .99, RMSEA = .05 [90% CI: .03, .08], and SRMR = .02) (Laborde et al., 2016).

Rosenberg Self-Esteem Scale (RSE; Rosenberg, 1965)

The RSE is a brief self-report that comprehensively assesses self-esteem, understood as a positive or negative attitude towards oneself. It classifies people into three groups (high, medium, and low self-esteem) based on 10 items that are answered on a 4-point Likert-type scale, from 1 = *strongly disagree* to 4 = *strongly agree*. It has been adapted to Spanish and has adequate psychometric properties (Cronbach's alpha = .84) (Martín-Albo et al., 2007).

Strengths and Difficulties Questionnaire (SDQ; Goodman, 1997)

The SDQ is a 25-item self-report that assesses 5 subscales: emotional symptoms, conduct problems, hyperactivity, peer problems and prosocial behaviour. Strengths are measured through the prosocial behaviour subscale, while difficulties are measured through the other four scales. Given the objectives of this study, the prosocial behaviour score (understood as the strengths) and the total difficulties score (understood as the sum of the other four scales) were of interest. We used the Spanish version downloaded from the official SDQ website (ww.sdqinfo.org) and with the permission of www.youthinmind.com to include the SDQ in our electronic survey. This version is answered on a three-point Likert-type scale (from 0 = *not true* to 2 = *true*). Its adaptation with a Spanish sample has shown good psychometric properties, with Cronbach's alphas between .69 and .78 (Ortuño-Sierra et al., 2015).

Social-Emotional Distress Survey (SEDS-S; Dowdy et al., 2018)

The SEDS-S is a screening questionnaire that assesses internalizing distress. It consists of 10 items that are answered on a 4-point Likert-type scale (from 1 = *completely false* to 5 = *very true*). In the original validation study with two independent samples of U.S. high school students, it was found that the SEDS-S distress factor was significantly associated with symptoms of anxiety and depression, and a significant negative association with life satisfaction. To date, there is no Spanish validation of the scale, so the instrument was translated into Spanish following an appropriate translation method described in the procedure.

Mental Health Continuum Short Form (MHC-SF; Keyes, 2009)

The MHC-SF is a 14-item self-report that measures emotional, psychological, and social well-being, also providing a total well-being score. It is answered on a 5-point Likert-type scale (from 1 = *never* to 5 = *everyday*) on how they have felt during the last month. The instrument used was the one validated in a Spanish sample which has shown good psychometric properties, with Cronbach's alpha between .86 and .93 for the three subscales, and .94 for the total (McDonald's Omega between .85 and .91, and .95, respectively) (Echeverría et al., 2017).

Civic Engagement Questionnaire (CEQ; Pilkauskaite-Valickiene, 2015)

The CEQ is a brief subscale developed from the Positive Youth Development Inventory (PYDI; Arnold et al., 2012). It measures, in general terms, young people's perception of their contribution to the community (e.g., I like working with others to solve problems or it is important to me to try to do something to change the world). It consists of 7 items answered on a 6-point Likert-type scale (from 1 = *strongly disagree* to 6 = *strongly agree*). The original version has an adequate reliability index, with an acceptable alpha (Cronbach's alpha = .82). The instrument was translated into Spanish following an appropriate translation method described in the procedure.

Procedure

Data were collected during the 2017/2018 academic year (during the months of October, November, December, and January) by administering a survey through the online data collection platform DetectaWeb (Piqueras et al., 2017). Participants were recruited through institutional outreach and were asked to sign the informed consent form to comply with ethical standards. Before releasing the survey, the project received approval from the university's ethics committee (Reference DPS.JPR.03.17).

The Spanish versions of the Civic Engagement Questionnaire and the Social-Emotional Distress Survey were adapted to the Spanish language according to the guidelines of the International Test Commission (Muñiz et al., 2013), i.e., the iterative translation method was followed. To do so, first, several independent translations were carried out. Secondly, these translations were reviewed by a joint committee of translators with knowledge of the Spanish language and culture, and specialists in the field of psychological assessment dealt with. They were responsible for assessing the appropriateness of the adapted version. Finally, interviews were conducted asking about the comprehension of the items to ensure that the young people understood them well.

Data analysis

Firstly, with the aim of obtain a detailed description of the sample profile, descriptive statistics and the mean of the scores obtained in the main scales of interest for this study were calculated: SD3 and TEIQue-SF. Secondly, Cronbach's Alpha and McDonald's Omega were calculated following the recommendations of Kalkbrenner (2021). Thirdly, bivariate correlations were calculated between the main variables of interest, i.e., between the Dark Triad traits and the EI factors; and between each of these variables and all other variables of interest to the study. For all these calculations, the statistical programs IBM SPSS (version 23) and Jamovi (version 1.6.23) were used.

Fourthly, to test H1, H2 and H3, a Latent Profile Analysis (LPA) was conducted to identify the profiles derived from the scores in seven variables: the three Dark Triad traits and the four EI factors. The aim was to find profiles that represented groups of people who responded in a similar way to the seven variables. For this purpose, the statistical programme Mplus (version 8.7) was used. With a view to determine the most optimal profile model, different fit indices were calculated for 6 models (from one profile to six profiles). More specifically, the Bayesian information criterion (BIC), the Akaike information criterion (AIC), the sample size adjusted BIC (SSA-BIC), the entropy, the Vuong-Lo-Mendel-Rubin (VLMR), and the adjusted likelihood ratio test (adjusted LRT) were calculated. To determine the most optimal model, the best combination of these indices was considered, considering the significance of the VLMR and adjusted LRT p-values, a value as close to 1 for entropy, and small AIC, BIC, and SSA-BIC values with the highest number of profiles. In addition, the Elbow Graph was also calculated with the extracted values of the BIC, AIC, and SSA-BIC indices, which helped to visually see the best solution.

Finally, to test H4, a multivariate analysis of variance (MANOVA) was performed to assess the differences between the profiles found from the LPA and the other variables of interest (self-esteem, psychological strengths and difficulties, personal distress, well-being, and civic engagement). For this purpose, IBM SPSS statistical software (version 23) was used again.

<div align="center">

Results

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Descriptive statistics, internal consistency of the instruments and association between Dark Triad traits and Emotional Intelligence

As can be seen in Table 1, the participants' highest score on the Dark Triad traits is on Machiavellianism, and the lowest on psychopathy. In relation to EI, the highest score is in the Emotionality factor.

Bivariate correlations show negative relationships between EI factors (and total score) and Machiavellianism and psychopathy (in this case, except for sociability, which is positive) ($p < .01$). In contrast, positive relationships are shown with narcissism (especially with the sociability and well-being factor) ($p < .01$ and $p < .05$). In relation to the other variables of interest, both EI factors (and total score) and narcissism correlate positively with those considered positive and negatively with those considered negative ($p < .01$ and $p < .05$), except in the case of psychological strengths (prosocial behaviour) since narcissism correlates negatively, although very weakly ($p < .01$). All these relationships with psychopathy and Machiavellianism are in the opposite direction ($p < .01$ and $p < .05$) (see Table 1 and Table 2).

Regarding the reliability of the instruments used, all factors showed acceptable internal consistency indices (between .71 and .91), except narcissism, self-control, emotionality, sociability, and psychological strengths (see Table 1 and Table 2).

Latent Profile Analysis

The results of the Latent Profile Analysis from the seven variables of interest (Dark Triad traits and EI factors) for the solutions from one to six profiles are presented in Table 3. It shows the different indices. After analysing the best combination of these and the Elbow Graph (see Figure 1), the 3-profile solution was the most optimal.

Table 1. Bivariate correlations between Dark Triad and Emotional Intelligence, means, standard deviations and reliability indices

	Narcissism	Machiavellianism	Psychopathy	*M (SD)*	Cronbach's Alfa	McDonald´s Omega
Wellbeing	.33**	-.10**	-.15**	31.04 (6.48)	.84	.85
Self-control	.09**	-.10**	-.23**	26.30 (5.56)	.59	.60
Emotionality	.07*	-.32**	-.33**	40.31 (6.94)	.64	.65
Sociability	.43**	.04	.11**	27.47 (5.47)	.57	.58
Total Emotional Intelligence	.33**	-.14**	-.19**	140.51 (20.11)	.86	.87
M (SD)	15.14 (5.27)	16.83 (6.64)	9.25 (5.60)	-	-	-
Cronbach's Alfa	.64	.79	.67	-	-	-
McDonald´s Omega	.65	.79	.71	-	-	-

Note. * $p < .05$, ** $p < .01$

Table 2. Bivariate correlations between variables of interest and Dark Triad and Emotional Intelligence, and their reliability indices

	Self-Esteem	Strengths	Difficulties	Personal distress	Emotional well-being	Psychological well-being	Social	Self-Esteem
Wellbeing	.80**	.14**	-.52**	-.57**	.67**	.69**	.54**	.39**
Self-control	.49**	.07*	-.56**	-.50**	.34**	.35**	.22**	.19**
Emotionality	.34**	.38**	-.36**	-.28**	.27**	.40**	.22**	.32**
Sociability	.46**	.04	-.26**	-.31**	.32**	.40**	.28**	.27**
Total Emotional Intelligence	.75**	.21**	-.06**	-.58**	.58**	.66**	.45**	.42**
Narcissism	.31**	-.06*	-.05	-.15**	.21**	.22**	.27**	.24**
Machiavellianism	-.07*	-.25**	.22**	.15**	-.04	-.06*	-.10**	-.11**
Psychopathy	-.11**	-.30**	.32**	.18**	-.09**	-.08**	-.13**	-.09**
Cronbach's Alfa	.88	.65	.70	.91	.83	.84	.78	.78
McDonald´s Omega	.89	.66	.71	.91	.83	.84	.78	.79

Note. * $p < .05$, ** $p < .01$

Table 3. Model fit indices for 1- through 6-profile solutions

Profiles	AIC	BIC	SSA-BIC	Entropy	VLMR	Adjusted LRT
1	24673.635	24745.367	24700.896			
2	23909.843	24022.564	23952.682	.660	.000	*p < .001*
3	23346.952	23500.663	23405.369	.731	.001	*p = .001*
4	23062.159	23256.859	23136.154	.763	.063	*p > .05*
5	22898.254	23133.943	22987.826	.762	.002	*p < .01*
6	22783.428	23060.106	22888.578	.761	.005	*p < .01*

Note. AIC = Akaike Information Criterion; BIC = Bayesian Information Criteria; SSA-BIC = BIC adjusted for sample size; VLRM = Vuong-Lo-Mendel-Rubin; LRT = Likelihood Ratio Test

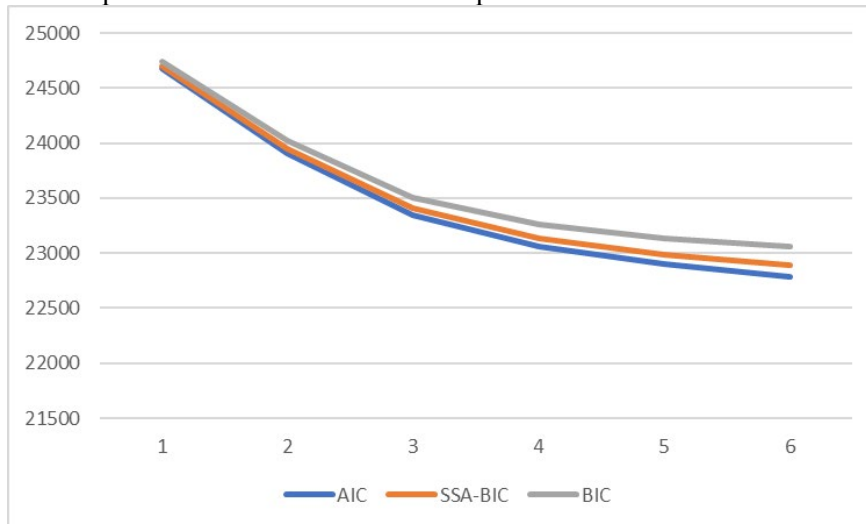*Figure 1*. Elbow Graph for the solutions from 1 to 6 profiles

Figure 2 shows the profiles of the chosen solution, together with the percentages of people in each of the three profiles. As can be seen, profile 1 represents participants characterised by low scores on the Dark Triad traits (especially on the narcissistic trait) and EI factors (especially on well-being and sociability); profile 2 represents participants with low scores on Machiavellianism and psychopathy, but medium-high scores on narcissism and EI; and profile 3 represents participants with high scores on the Dark Triad traits and medium-low scores on EI (especially on emotionality). Of the three profiles, profile 3 is the profile with the highest dark traits, and profile 2 is the profile with the highest EI.

Figure 2. Mean values of Dark Triad traits and Emotional Intelligence factors as a function of latent class
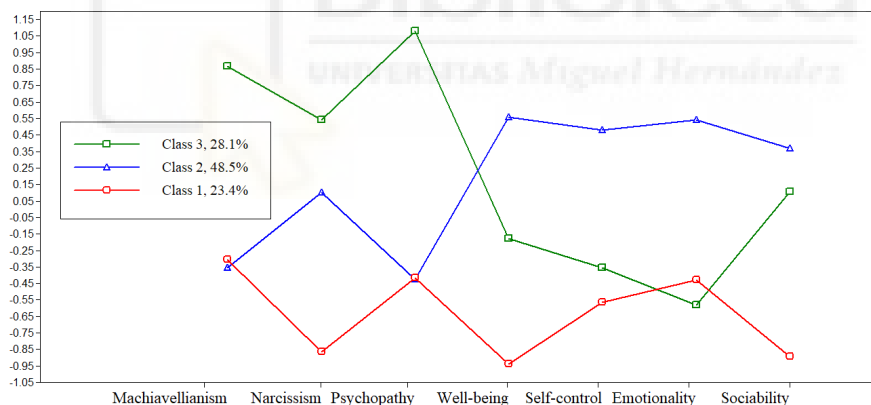
Differences between profiles

In the multivariate analysis of variance (MANOVA), statistically significant differences were found between the three profiles in the different variables of interest ($p < .001$; Wilk's $\lambda = .001$; partial $\eta 2 = .31$) (see Table 4). More specifically, post hoc comparisons revealed significant differences between the profiles on each of the variables, except between profile 1 and 3 on the difficulty variable.

Table 4 and Figure 3 show that, of the three profiles, profile 2 (low Machiavellianism and psychopathy, and medium-high narcissism and EI) has the highest self-esteem, personal strengths, well-being (emotional, psychological, and social) and commitment to their community; and the lowest psychological difficulties and personal distress. In turn, profile 1 (low Dark Triad and EI) appears to have the most difficulties, personal distress, and problems with self-esteem, well-being, and civic engagement. Profile 3 (high Dark Triad and medium-low EI) would present fewer psychological strengths.

Discussion

The aim of this study was, on the one hand, to identify latent profiles based on the Dark Triad traits and EI factors proposed by Petrides (2009a) in Spanish university students; on the other hand, to examine the differences between the profiles found, taking into account two types of variables: the variables that different authors proposed as possible explanations for the positive relationship between narcissism and EI (self-esteem, prosocial behaviours and low levels of personal distress); and the variables that we know to be related to EI and narcissism positively (well-being, civic engagement and psychological strengths) and negatively (psychological difficulties-psychopathology).

Table 4. Differences of the four profiles in the other variables of interest

Variables	M (SD)			$F_{(2, 1241)}$	ηp^2
	Profile 1 (*n* = 283)	Profile 2 (*n* = 603)	Profile 3 (*n* = 355)		
Self-esteem	-0.92 (0.88)	0.49 (0.75)	-0.10 (0.91)	266.93***	.31
Strengths	-0.03 (0.98)	0.26 (0.79)	-0.46 (1.77)	59.15***	.09
Difficulties	0.54 (0.94)	-0.52 (0.77)	0.45 (0.97)	195.74***	.25
Personal distress	0.65 (0.94)	-0.46 (0.82)	0.23 (0.94)	163.50***	.22
Emotional well-being	-0.70 (0.98)	0.40 (0.81)	-0.13 (0.97)	139.82***	.19
Psychological well-being	-0.76 (1.01)	0.46 (0.75)	-0.15 (0.93)	187.21***	.24
Social well-being	-0.60 (1.02)	0.33 (0.86)	-0.10 (0.97)	92.71***	.14
Civic engagement	-0.50 (1.02)	0.30 (0.88)	-0.10 (0.98)	68.81***	.11

Note. ***$p < .001$.

Figure 3. Standardised mean scores (z-score, *M* = 0) of different profiles on the variables of interest
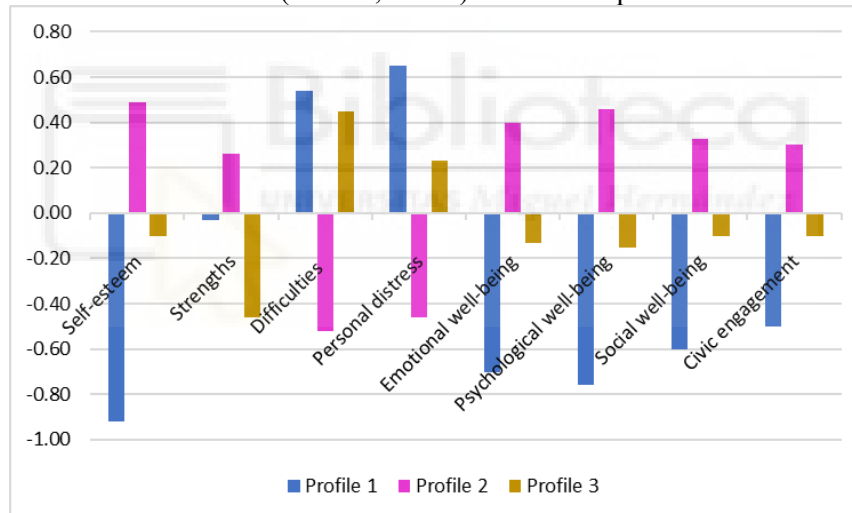
Given the inconsistencies in the results shown in the previous literature (with observational-correlational designs), in this study we expected to find different profiles: a profile with high Dark Triad traits and low EI (H1), a profile with low Dark Triad traits and high EI (H2), and a profile with low Machiavellianism and psychopathy traits, and high narcissism and EI (H3) traits (Hjalmarsson & Dåderman, 2020; Hyde et al., 2020; Miao et al., 2019; Michels & Schulze, 2021; Nagler et al., 2014; Plouffe et al., 2017; Schreyer et al., 2021; Szabó, 2019; Szabó & Bereczkei, 2017; Veselka et al., 2012; Walker et al., 2021; Zhang et al., 2015). In this sense, the results reveal the differentiation of these three profiles. The first profile shows low scores on both dark traits and EI, which has not been related to any of the previous hypotheses. A second profile, with low scores on Machiavellianism and psychopathy, medium scores on narcissism and high scores on EI. These results would partially support H3. And finally, a third profile with high scores on dark traits and low scores on EI, which is consistent with our first hypothesis. However, our data would not support the presence of a profile with low triad scores that exhibits social competence (H2), which is contrary to several systematic reviews (Miao et al., 2017; Walker et al., 2021). These authors conclude that people with high scores on these traits will have low EI scores. In other words, they consider that people high in EI are less likely to be high in these undesirable personality traits, as the relationship

is negative (with Machiavellianism and psychopathy) and/or non-significant (with narcissism). In terms of dark trait values, the first and second profiles differ basically in the narcissism score. This is not the case for EI, where there are notable differences in all factors.

Therefore, this study is further evidence that people with narcissistic traits and high EI can exist, as is also shown by the positive correlations obtained between these two variables (negative in the case of Machiavellianism and psychopathy) (Hjalmarsson & Dåderman, 2020; Hyde et al., 2020; Nagler et al., 2014; Petrides et al., 2011; Plouffe et al., 2017; Schreyer et al., 2021; Szabó, 2019; Szabó & Bereczkei, 2017; Veselka et al., 2012; Zhang et al., 2015). In addition, it is also important to note that the profile with the least narcissistic traits is the one with the lowest EI (Profile 1). As observed in Figure 2, there are groups of people with the same low scores in Machiavellianism and psychopathy, but just when narcissism is medium-high, so is EI (Profile 2), and when narcissism is low, so is EI (Profile 1). In line with the findings of some studies, it is true that people with high scores in the three traits of the Dark Triad seem to have little EI, so it is difficult to conclude that there could be a dark EI (Miao et al., 2017; Michels & Schulze, 2021; Walker et al., 2021). However, it is also true that the narcissistic trait seems to be playing an important role and, perhaps, one could speak of an EI with narcissistic traits (Hjalmarsson & Dåderman, 2020; Hyde et al., 2020; Nagler et al., 2014; Van Groningen et al., 2021).

In this study we also expected to find differences in the profiles obtained according to the other variables of interest, finding that the profile with low Machiavellianism and psychopathy, and medium-high narcissism and high EI, would obtain a higher mean in the positive variables and lower in the negative ones (H4). Given the results, the hypothesis is confirmed (e. g., Nagler et al., 2014; Szabó & Bereczkei, 2017; Veselka et al., 2012).

As already mentioned, the authors who have obtained positive relationships between narcissism and EI in their studies consider that perhaps these relationships could be due to the need of narcissistic individuals to maintain their grandiose view of themselves, their tendency to show prosocial behaviours, the fact that they are also optimistic, likeable and popular, their high self-esteem and self-worth (which may lead them to overestimate their abilities), or their low levels of personal distress (e. g., Nagler et al., 2014; Szabó & Bereczkei, 2017; Veselka et al., 2012). In this study, people with low Machiavellianism and psychopathy, and medium-high narcissism and EI (Profile 2) present higher self-esteem, prosocial behaviours (psychological strengths) and lower levels of personal distress. Therefore, the results of this study seem to affirm these assumptions raised in previous literature. In turn, these individuals (Profile 2) also appear to be those with higher well-being, more engagement with their community and fewer psychological difficulties (psychopathology). Thus, the results of this study are in line with previous findings and add evidence to the scope of the study (Papageorgiou et al., 2017, 2019, 2020; Rico-Bordera et al., 2021; Stead et al., 2012; Womick et al., 2020).

Like any study, this one also has some limitations. Among them is the design of the study, as it is a cross-sectional study, the results cannot be generalised, and it is not possible to establish clear causal relationships. For future research, it would be very interesting to carry out a longitudinal design that would allow for more exhaustive analyses, especially in relation to the causality of the variables. A second limitation is related to the type of sampling used (i.e., convenience sampling), which also makes it difficult to generalise the results. Finally, another limitation is related to the low consistency of some of the subscales used in the study.

Conclusion

The relationship between narcissism and Emotional Intelligence did not seem to be very clear and, therefore, neither did the idea of whether a dark EI could exist. This study seems to show that there are indeed people with narcissistic traits who have high EI, as it is the first study to analyse latent profiles with Dark Triad traits and EI. It could be concluded that perhaps what exists is an EI with narcissistic traits that may predispose people to display certain emotions that maximise personal gain and shape others. Therefore, they will also tend to present high self-esteem, well-being, prosocial behaviour, engage with their community, and low personal distress and psychological difficulties. In addition, this work has not confirmed that there is a profile with low scores on dark traits and high scores on EI. These findings have implications for the design of preventive actions focused on improving emotional education, because of the need to consider negative personality

traits, as making EI-based intra- and interpersonal skills available to people with prominence towards dark traits may not be a recommendable practice (Davis & Nichols, 2016; Gentina et al., 2018; Kilduff et al., 2010; Wood, 2020), as it may put society at risk given the positive relationship between dark traits and a wide variety of violent behaviours (Alsheikh Ali, 2020; Carton & Egan, 2017; Hayes et al., 2021; Pineda, Galán et al., 2021; Pineda, Martínez-Martínez, 2021; Pineda, Rico-Bordera, 2021).

Declaration of conflicting interests

The authors declares that there is no conflict of interests.

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Appendix 4

Study 4

Unveiling the depths of Tinder: Decoding the Dark Tetrad and sociosexuality in motives behind online dating

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Unveiling the depths of Tinder: Decoding the Dark Tetrad and sociosexuality in motives behind online dating

Abstract

Dark Tetrad and sociosexual orientation play a role in the dating apps use. Two studies were proposed: Validate a short version of the Tinder Motives Scale (TMS) and identify Dark Tetrad and unrestricted sex orientation profiles and analyse the differences between them and the Tinder motives. In the first study we measured Tinder use motives, and in the second study we measured Tinder motives with the new scale, the Dark Tetrad and sociosexual orientation. Results offered a shorter version of the TMS, and three-profiles: Non-dark and non-sociosexual, Slightly narcissistic and sociosexual, and High-dark and slightly sociosexual. There were differences between profiles and Tinder motives. Less dark and restricted sex people were more motivated to use Tinder for romantic partners, while those who score moderately on Dark Tetrad were more interested in sexual purposes. Knowing the Tinder uses and the characteristics of those who use it is essential to mitigate misuse.

Key words: Dark Triad; Machiavellianism, psychopathy, sadism; clusters.

1. Introduction

1.1. Dating apps, the rise of Tinder, and motives to use these apps

With the advent of the Internet and smartphones, dating apps have become increasingly popular in recent years, thanks to their ease of use and accessibility, and the ability to quickly connect with others (Anzani et al., 2018; David & Cambre, 2016; Duguay, 2017; Smith, 2016). This new way of connecting with others has revolutionized the way people interact and form romantic relationships, becoming for many people the best option for interaction (Sumter et al., 2017).

Among the various apps available, Tinder has become one of the most widely used and recognized, with millions of active users worldwide choosing it as their app of choice (Duguay, 2017; Iqbal 2023; Statista, 2022; Sumter & Vandenbosch, 2019). Specifically, prevalence data collected in a recent systematic review indicate that between 40% and 50% of people use or have used a dating app regularly with Tinder being the app of choice in up to 88% of cases (Castro & Barrada, 2020; Sumter & Vandenbosch, 2019). Furthermore, the same review concluded that dating apps are used regardless of gender, age, marital status, sexual orientation, education, and income level (Castro & Barrada, 2020).

However, even though all these applications are known as "dating applications", in recent years their users are also using them for reasons other than meeting someone to establish a romantic relationship (Gudelunas, 2012; Phan et al., 2021; Sumter et al., 2017; Sumter & Vandenbosch, 2019; Timmermans & De Caluwé, 2017; Van De Wiele & Tong, 2014; Wu & Trottier, 2022). Particularly in relation to the Tinder app, several studies have recorded, in addition to the motive of finding a romantic partner, the following reasons for use: seeking casual sex (e.g. to have sex one night only), the ease of being able to communicate with other people (e.g. because they feel more shy in person), seeking self-esteem validation (e.g. to feel more attractive), because they find it exciting (e.g. they may find it entertaining to use), or for being fashionable (e.g. because everyone around them uses it) (Sumter et al., 2017; Sumter & Vandenbosch, 2019). These different motives can be grouped into 13 different categories, namely: social approval, relationship seeking, sexual experience, flirting/social skills, travelling, ex, belongingness, peer pressure, socializing, sexual orientation, pass time/entertainment, distraction, and curiosity. Based on these categories, it has been developed the Tinder Motives Scale (TMS; Timmermans & De Caluwé, 2017).

1.2. What variables are associated with motives for using Tinder? The role of dark personality and unrestricted sex

Personality is one of the most important variables determining the different reasons for using dating apps (Castro & Barrada, 2020). The personality traits that have received the most attention in recent years are the undesirable personality traits, such as the Dark Tetrad traits, given their relationships with a wide variety of antisocial behaviours, such as bullying and cyberbullying, sextortion, physical, verbal, and sexual aggression, and other types of crime (e.g., Alsheikh Ali, 2020; Chester et al., 2019; Moor & Anderson, 2019; Pineda et al., 2022, 2023).

The Dark Tetrad is a set of four malevolent traits (Chabrol et al., 2009; Paulhus & Williams, 2002): (1) narcissism, which is characterized by a mixture of vanity and self-centred admiration of one's own qualities, associated with a feeling of superiority, which in turn leads to a constant search for validation and ego reinforcement; (2) Machiavellianism, which is characterized by a deceptive interpersonal style marked by cynicism, immorality and self-interest and personal gain. These individuals are defined by manipulation, strategic orientation, and forward planning to achieve their own goals; (3) Psychopathy, which is characterized by antisocial behaviour, diminished empathy and remorse for their actions, and disinhibited behaviour associated with impulsivity; and (4) Sadism, which is characterized by deriving pleasure or enjoyment from observing or causing harm to others. These individuals may intentionally inflict pain and suffering to assert power, dominance or simply for their own pleasure (Paulhus, 2014).

There are different reasons why studies have sought to analyse the relationships between these traits and the use and reasons for use of dating apps. On the one hand, they have found that the use of online dating apps has been associated with an increased likelihood of victimization experiences, such as sexual victimization by adults and peers and cybercrimes (Choi et al., 2018; Kaakinen et al., 2021). This association seems to be explained by the fact that users of such applications are involved in a greater number of risky activities (Kaakinen et al., 2021). On the other

hand, the use of these apps has been associated not only with victimization, but also with the perpetration of online antisocial behaviour. Thus, a recent systematic review addressed the different risks that have been associated with this practice and concluded that users of these apps may lie and deceive others to achieve certain goals, may engage in a greater number of risky sexual practices, may cause physical and/or psychological harm to others on purpose, and may engage in cybercrime and bullying behaviour (Phan et al., 2021). As discussed above, some of these risky behaviours have also been associated with Dark Tetrad traits. In addition, several studies have tested the positive relationship between these traits and the perpetration of antisocial behaviour when using dating apps (Duncan & March, 2019; Mayshak et al., 2020).

Although there is limited literature on this topic, studies that have analysed the association between these undesirable traits and the various motives for using the Tinder application have generally found similar relationships. Specifically, the four Dark Tetrad traits appear to be positively related to more sexual motives and social approval, as well as to motives related to distraction and entertainment. In turn, none of the traits have been related to the original motive for which dating apps were designed, i.e., to find a romantic relationship (Freyth & Batinic, 2021; Lyons et al., 2022; Timmermans et al., 2018).

When it comes to predicting motives for using Tinder, more noticeable differences appear among the four traits. A recent study by Lyons et al. (2022) found that sadism did not predict any motive for use, narcissism only negatively predicted the motives of flirting enhancement and social skills, and psychopathy only positively predicted the motive of sexual experience and distraction. In contrast, they found that Machiavellianism was a positive predictor of social approval, enhancement of flirting and social skills, travel, social pressure, and entertainment/time spent. Although these predictions were controlled for gender and trolling, this study was able to conclude that sadism and narcissism appeared to have little relationship with Tinder use motives, that people with high scores on psychopathy might be more motivated by sexuality and distraction, and that people with high scores on Machiavellianism might use Tinder for different utilitarian motives.

Based on the idea that people with high scores on dark traits seem to use Tinder for reasons related to sexual experience rather than for reasons related to finding a romantic relationship (e.g., Lyons et al., 2022), attempts have been made to analyse the relationship between these traits and sociosexual orientation (i.e., orientation towards unrestricted sexuality), which is strongly linked to self-control (Burtaverde, 2021; Gailliot & Baumeister, 2007; Lechuga & Jones, 2021; Malesza & Kaczmarek, 2021; Sevi, 2019). Research findings indicate that people who use Tinder appear to score higher on Dark Tetrad traits and seem to display greater inclination towards sexual behaviours. Consequently, their usage of the app tends to be more focused on short-term rather than long-term pursuit of sexual partners. Dating apps could be a new, easier way than traditional "face-to-face" for these people to carry out their short-term mating strategies (Sevi, 2019).

1.3. The present study

Given the widespread use of dating apps, and Tinder in particular, it is essential to understand the reasons for their use. Dark Tetrad traits appear to predict motives for Tinder usage in different ways. Therefore, individuals with a higher score in certain traits may exhibit stronger motivation towards specific usage motives compared to others. Understanding these distinctions can provide valuable insights into the diverse motivations that drive individuals to engage with the app (Lyons et al., 2022). Even so, it seems that sexual motives are one of the main reasons why people with high Dark Tetrad scores use Tinder. And on the other pole, the motive of seeking a romantic relationship appears to be less influential in driving individuals to use the app (Freyth & Batinic, 2021; Lyons et al., 2022; Timmermans et al., 2018). Hence, both dark traits and sociosexual orientation seem to play a relevant role in the study of what motivates people to use apps like Tinder (Lyons et al., 2022; Sevi, 2019). However, no study has been located that has jointly analysed the relationship between these three variables, i.e., motives for using Tinder, the Dark Tetrad and sociosexual orientation.

Latent Profile Analysis (LPA), unlike other more classical classification techniques, is an innovative person-centred methodology that allows groups of people to be identified based on their scores on different scales simultaneously to determine the probability that each person belongs to a latent profile. It also considers the differential variation in scores between profiles. Thus, LPA allows

individuals to be classified into homogeneous profiles and then examine the differences between them based on other variables of interest (Williams & Kibowski, 2015).

Based on this, in the present study, two studies were proposed with the following objectives: (1) Due to the lack of validated scales in Spanish population to measure Tinder use motives, the first study aimed to validate a short version of the TMS of Timmermans et al. (2017) in Spanish sample. Following the principle of parsimony (Vandekerckhove et al., 2015), the aim was not to obtain a validation of the full scale (i.e., all 58 items), but to validate a shorter version; (2) Based on the above approach, the second study aimed first to identify profiles of individuals in terms of their dark traits (i.e., Dark Tetrad) and their orientation towards unrestricted sex (i.e., sociosexual orientation). As a second, and main, objective of this second study, it was proposed to analyse the differences between the profiles found based on the different reasons for using Tinder.

Following the previous literature, the hypotheses that were put forward were the following: (H1) It is expected to obtain a shorter but psychometrically sound version of the TMS, maintaining the 13 motives of use of the original scale; (H2) It is expected that the study sample does not use Tinder solely for the purpose of finding a romantic relationship or for sexual purposes, i.e. the sample is expected to make use of the 13 different reasons for use; (H3) Given that this is the first study that aims to obtain profiles based on the Dark Tetrad traits and sociosexual orientation, it has not been possible to put forward a hypothesis based on previous literature. However, taking into account the relationships found in previous studies between these variables, we expect to find at least two profiles, i.e., one with high scores on dark traits and sexual orientation, and one profile with low scores on both; (H4) It is expected to find differences between the profiles and the different motives for using Tinder, with the profile with high scores on dark traits and sexual orientation having more sexual, social approval, and distraction and entertainment motives especially.

2. Study 1
2.1. Method
2.1.1. Participants

With a minimum required size of 200 participants (Kline, 2011), a total of 234 Spanish subjects were recruited, aged between 18 and 66 years and with a mean age of 30.58 ($SD = 7.72$), participated in the study. Of these, 67.90% were women ($n = 159$). In terms of marital status, most of the participants were single (62.40%; $n = 146$), or living with a partner, but without legal recognition (23.10%; $n = 54$). In terms of education, most of them, i.e., 38% ($n = 89$), had a bachelor's degree, followed by 20.50% ($n = 48$) who had a vocational training, and 20.10% ($n = 47$) who had a master's degree, a specialization, or a university expert. Finally, regarding their employment status, half of the sample, i.e., 52.60% ($n = 123$), were employed full-time; and 22.60% ($n = 53$) were still student. Inclusion criteria for participation in the study were being over 18 years old and being a current or previous user of the dating app Tinder.

2.1.2. Measures
Tinder Motives Scale (TMS)

The TMS (Timmermans & De Caluwé, 2017) is a 58-item scale that measures motives for using the dating app Tinder. Specifically, it includes 13 variables that refer to 13 different reasons for using the app (Cronbach's alpha coefficients [α] corresponding to the values obtained in the original validation study are indicated in brackets): social approval (e.g., "to see how desirable I am"; 6 items; α = .91), relationship seeking (e.g., "to find someone for a serious relationship"; 5 items; α = .93), sexual experience (e.g., "to find a one-night-stand"; 6 items; α = .91), flirting/social skills (e.g., "because it is hard to talk to people in real life"; 6 items; α = .86), travelling (e.g., "to meet other travellers/locals when in a foreign country"; 5 items; α = .95), ex (e.g., "to think less about my ex"; 3 items; α = .95), belongingness (e.g., "because everyone uses Tinder"; 4 items; α = .74), peer pressure (e.g., "because my friends thought I should use Tinder."; 3 items; α = .70), socializing (e.g., "to make new friends"; 4 items; α = .85), sexual orientation (e.g., "to meet singles with a similar sexual orientation"; 3 items; α = .91), pass time/entertainment (e.g., "for fun"; 7 items; α = .90), distraction (e.g., "as a break at work or during a study period"; 3 items; α = .80), and curiosity (e.g., "to see what the application is about"; 3 items; α = .77). Each of the items is answered on a 7-point Likert-type scale ranging from 1 = *strongly disagree* to 7 = *strongly agree*.

Tinder use and outcomes (ad hoc)

As measured in the original validation study of the TMS (Timmermans & De Caluwé, 2017), participants were asked about their use of the app. Specifically, they were asked about how often they used Tinder, allowing them to respond on a 7-point Likert-type scale (1 = *almost never*, 2 = *once a month*, 3 = *several times a month*, 4 = *once a week*, 5 = *several times a week*, 6 = *every day*, and 7 = *several times a day*). They were also asked about the number of Tinder users they had met face-to-face, and then asked how many of those people they had met face-to-face (1) had a romantic relationship, (2) kissed, (3) had a sexual interaction, (4) had a casual sexual relationship, (5) and had become friends with. These last questions were answered with an open numerical response option.

2.1.3. Procedure

Participants were recruited through the dissemination of the survey (convenience sampling) on different social networks, such as Twitter, Facebook, and Instagram. The survey was designed using the LimeSurvey platform (https://www.limesurvey.org/es/) and included the assessment of more variables, which were part of the second study (see study 2 for more information). To carry out the study, the project received approval from the university's ethics committee (Reference DPS.JPR.02.20) and all participants had to give their consent to participate in the study.

To conducting the validation of the scale and adapt it to the Spanish language, the guidelines of the International Test Commission were followed. Specifically, an iterative translation method was used, consisting, first, of several independent translations and, finally, the revision of both translations by a committee of translators (Muñiz et al., 2013).

The syntax and data of this study are available in the OSF repository by following the link below: https://osf.io/34df8/?view_only=7d2ebeea84634e06a2daa0ae00cd4438

2.1.4. Data analysis

Confirmatory Factor Analysis (CFA) were performed to obtain a brief version of the TMS. To estimate the factor loadings accurately, Diagonally Weighted Least Squares (DWLS) was selected, and to judge the goodness of fit of the model, it was taken into account that the chi-square ($\chi 2$) value was significant ($p < .05$), the Normalized Fit Index (NFI) value was greater than .90, the Comparative Fit Index (CFI) was greater than or equal to .95, the value of the Goodness of Fit Statistic (GFI) was greater than or equal to .90, the value of the Standardized Root Mean Residual (SRMR) was less than or equal to .05, and the value of the Root Mean Squared Error Approximation (RMSEA) was less than or equal to .08 (Hu & Bentler, 1999; Kline, 2011). These analyses were performed with the R statistical program (R Core Team).

Descriptive statistics, i.e., means and standard deviations, and internal consistencies, i.e., Cronbach's Alpha and McDonald's Omega, and the Composite Reliability (CR) index of the new briefer version of the TMS were performed. Convergent and discriminant validity were also analysed. For this purpose, the values of the Average Variance Extracted (AVE) and the correlations between the 13 variables were obtained. Values above .70 in CR would indicate high internal consistency, values above .50 in AVE would indicate high convergent validity, and values below .70 in the correlations between variables would indicate good discriminant validity (Cheung & Wang, 2017; Fornell & Larcker, 1981; Netemeyer et al., 2003).

Finally, Pearson's bivariate correlations with the Tinder use and outcomes were obtained to investigate the construct validity of the new scale, as was done in the original validation study (Timmermans & De Caluwé, 2017). However, for variables where a standard deviation greater than the mean was obtained, indicating a non-normal distribution, Kendall's Tau-b correlations were obtained to obtain tighter results (Newson, 2002). For these analyses, the statistical programs SPSS (version 25) and Jamovi (version 2.2.5) were employed.

2.2. Results

2.2.1. Confirmatory Factor Analysis (CFA) of the Tinder Motives Scale-Short Form (39-items TMS-SF)

The CFA yielded factor loadings for the 58 items comprising the 13 factors. After ordering these loadings from highest to lowest for each trait, following the principle of parsimony (Vandekerckhove et al., 2015), those with the lowest loadings were excluded, leaving only three items per factor, i.e., 39 items in total. Table 1 shows the factor loadings of the 58 items for the long version and the factor loadings of the three items selected with the highest loadings to create the short version of 39 items.

Table 1

Factor structures of the Tinder Motives Scale (58-items TMS) and the Tinder Motives Scale-Short Form (39-items TMS-SF) obtained with Confirmatory Factor Analysis

	58-items TMS / 39-items TMS-SF												
	SA	RS	SE	F/SS	T	E	B	PP	S	SO	PT/E	D	C
TM_1	.83 / —												
TM_2	.84 / —												
TM_3	.87 /.90												
TM_4	.88 / .86												
TM_5	.89 /.91												
TM_6	.79 / —												
TM_7		.92 / .92											
TM_8		.96 / .98											
TM_9		.77 / .76											
TM_10		.74 / —											
TM_11		.60 / —											
TM_12			.70 / —										
TM_13			.72 / .64										
TM_14			.72 / —										
TM_15			.80 / .80										
TM_16			.80 / .85										
TM_17			.68 / —										
TM_18				.80 / —									
TM_19				.84 / .87									
TM_20				.90 / .86									
TM_21				.90 / .93									
TM_22				.54 / —									
TM_23				.54 / —									
TM_24					.65 / —								
TM_25					.94 / .95								
TM_26					.96 / .96								
TM_27					.87 / .84								
TM_28					.85 / —								
TM_29						.95 / .95							

	SA	RS	SE	F/SS	T	E	B	PP	S	SO	PT/E	D	C
						58-items TMS / 39-items TMS-SF							
TM_30						.99 / .99							
TM_31						.97 / .97							
TM_32							.86 / —						
TM_33							.94 / .93						
TM_34							.97 / .98						
TM_35							.81 / .81						
TM_36								.90 / .90					
TM_37								.91 / .91					
TM_38								.59 / .59					
TM_39									.83 / .90				
TM_40									.78 / .82				
TM_41									.78 / .72				
TM_42									.64 / —				
TM_43										.94 / .94			
TM_44										.97 / .97			
TM_45										.87 / .87			
TM_46											.83 / .88		
TM_47											.87 / .93		
TM_48											.69 / —		
TM_49											.86 / .86		
TM_50											.72 / —		
TM_51											.82 / —		
TM_52											.70 / —		
TM_53												.67 / .66	
TM_54												.83 / .83	
TM_55												.94 / .94	
TM_56													.58 / .58
TM_57													.95 / .94
TM_58													.96 / .96

Note. TM = Tinder Motive; SA = Social approval; RS = Relationship seeking; SE = Sexual experience; F/SS = Flirting / social skills; T = Travelling; E = Ex; B = Belongingness; PP = Peer pressure; S = Socializing; SO = Sexual orientation; PT/E = Pass time / entertainment; D = Distraction; C = Curiosity.

From the CFA of the 58-item TMS, with the thirteen factors, the following fit indices were extracted: $\chi2$ = 3680.536, DF = 1517, $p < .001$, NFI = .742, GFI = .646, CFI = .829, SRMR = .086, RMSEA = .079. For the 39-item TMS-SF, from the CFA of this scale and the thirteen traits, the following fit indices were extracted: $\chi2$ = 1211.576, DF = 624, $p < .001$, NFI = .864, GFI = .803, CFI = .928, SRMR = .062, RMSEA = .064. These results indicated that the 58-item model does not fit too well since the fit indices are not in acceptable ranges, indicating the existence of a substantial discrepancy between the model and the data. In contrast, in the 39-item model, the fit indices did indicate a good fit.

2.2.2. Descriptive statistics and reliability coefficients for the Tinder Motives Scale-Short Form (39-items TMS-SF)

The highest scores were obtained on the socialisation, entertainment, and curiosity variables, so these seem to be the main reasons why the sample uses or used to use Tinder. The least frequent reason for use appeared to be "to be belongingness". Regarding reliability indices, high α (between .80 and .98) and ω (between .81 and .98) values were obtained for each of the 13 variables, as well as values above .70 in CR, which indicated that the scale has an adequate internal consistency. In turn, the AVE also showed optimal values, because for all the variables they were higher than .50, which was indicative of a high level of convergent validity. Finally, there were no correlations between variables higher than .70 (all were between .03 and .53), which was indicative of adequate discriminant validity (Table A.1; Appendices).

2.2.3. Correlation analysis between the Tinder Motives Scale-Short Form (39-items TMS-SF) and the Tinder use and outcomes

Tinder use correlated significantly and positively ($p < .05$ and $p < .01$) with five of the 13 reasons for Tinder use, that is, with relationship seeking, travelling, socializing, sexual orientation, and pass time/entertainment. In turn, the motives that were significantly and positively associated with the highest number of outcomes were relationship seeking, sexual experience, socializing and sexual orientation ($p < .05$ and $p < .01$). In general, all relations show small magnitudes of association (Table 2).

Table 2

Bivariate correlations between the Tinder Motives Scale-Short Form (39-items TMS-SF) and the Tinder use and outcomes

TMS factor	Tinder use	Tinder Meet Ups	Tinder Relationship	Tinder Kiss	Tinder Sex	Tinder Sexual Relationship	Tinder Friends
SA	-.01	.01	.11*	.03	.03	.07	.06
RS	.15*	.12*	.27**	.11*	.11*	.04	.08
SE	.09	.15**	.06	.20**	.20**	.28**	.03
F/SS	.05	.02	.04	.03	.03	.08	-.01
T	.13*	.13**	.06	.08	.04	.04	.16**
E	-.02	.05	.10	.06	.07	.08	.04
B	-.08	-.06	-.05	-.06	-.07	-.01	-.02
PP	-.05	-.07	-.02	-.06	-.05	-.04	-.02
S	.20**	.19**	.13*	.12*	.09	.10	.25**
SO	.17*	.19**	.21**	.22**	.21**	.24**	.05
PT/E	.13*	.09*	.07	.06	.05	.07	.04
D	.09	.05	.10	.04	.03	.06	.05
C	-.01	-.02	-.01	-.01	-.02	-.02	.04
M	3.03	5.55	1.08	3.16	2.47	2.08	1.57
SD	2.10	8.73	2.41	4.90	4.11	4.23	2.69

Note. TM = Tinder Motive; SA = Social approval; RS = Relationship seeking; SE = Sexual experience; F/SS = Flirting / social skills; T = Travelling; E = Ex; B = Belongingness; PP = Peer pressure; S = Socializing; SO = Sexual orientation; PT/E = Pass time / entertainment; D = Distraction; C = Curiosity; *p* < 0.05; **p* < 0.01; Pearson correlation for Tinder use and Kendall's Tau-b for all other variables.

3. Study 2

3.1. Method

3.1.1. Participants

The participants were the same as in Study 1, although 34 had to be discarded because they did not respond to all items of the scales of interest for this second study. As a result, the final sample consisted of 200 participants, with the same socio-demographic characteristics as in Study 1, i.e., with a mean age of 30.78 ($SD = 7.99$) and with 67.50% female representation.

To determine the sample size for our main outcome (i.e., the differences between the profiles found in terms of Tinder use motives), we conducted an a priori power analysis using G*Power (version 3.1.9.7). We aimed for 80% power assuming an alpha level of .05. For the estimation of effect size, we relied on the recommendations of two papers. One suggested that the effect for relationship-focused studies is $d = .22$ (Richard et al., 2003), and the other suggested that, depending on the type of study analysis (in our case, ANOVA, fixed effect, omnibus, one-way), the effect is $d = .30$ (Uakarn et al., 2021). Based on this, the analyses indicated that a minimum sample size of $N = 166$ and $N = 90$, respectively, was required for the present study.

3.1.2. Measures

Tinder Motives Scale-Short Form (TMS-SF)

The TMS-SF validated in the Study 1, derived from the 58-item scale of Timmermans and De Caluwé (2017), was used to measure the motives for Tinder use. It consists of 39 items and includes the same 13 variables as the original version, referring to 13 different reasons for using the app (see Study 1 for more information).

Short Dark Triad (SD3)

The SD3 (Jones & Paulhus, 2014) is a 27-item scale that measures the three personality traits of the Dark Triad: narcissism (e.g., I know I'm special, because everyone tells me I am), Machiavellianism (e.g., You should avoid conflicts with others, because they can be useful in the future), and psychopathy (e.g., It is true that I can be cruel to others). Each trait is assessed with 9 items that are answered on a Likert-type scale from 0 = *strongly disagree* to 4 = *strongly agree*. In the Spanish validation, acceptable psychometric properties have been obtained, with a α of .73 for Machiavellianism, .61 for narcissism, and .68 for psychopathy (Pineda et al., 2020).

Assessment of Sadistic Personality (ASP)

The ASP (Plouffe et al., 2017) is a brief scale that assess the everyday sadism (e.g., I like to make fun of other people in front of their friends). It contains 9 items that are answered on a Likert-type scale from 0 = *strongly disagree* to 4 = *strongly agree*. The validation with a Spanish sample obtained adequate internal consistency indices, with a α of .75 (Pineda et al., 2021).

Revised Sociosexual Orientation Inventory (SOI-R)

The SOI-R (Penke & Asendorpf, 2008) is a 9-item scale that assess three dimensions of sociosexuality (with three items per dimension), i.e. orientation towards unrestricted sex: sociosexual behaviour (e.g., How many different people have you had sex with without being interested in a serious long-term relationship?), attitudes towards sociosexuality (e.g., Sex without love is OK), and desire to have relationships without commitment (e.g., How often do you have a sexual arousal when you come into contact with a person with whom you are not in a serious romantic relationship?). The three dimensions are answered on a 9-point Likert-type scale: the first from 0 partners to 20 or more partners, the second from 1 = *strongly disagree* to 9 = *strongly agree*, and the third from 1 = *never* to 9 = *at least once a day*. The validation in the Spanish sample provided good psychometric properties of the scale, with α = .93 for behaviour, α = .82 for attitudes, α = .84 for desire (Barrada et al., 2018).

3.1.3. Procedure

As the sample is the same as in Study 1, the procedure is also the same (see Study 1 for more information). The syntax and data of this study are available in the OSF repository by following the link below: https://osf.io/34df8/?view_only=7d2ebeea84634e06a2daa0ae00cd4438

3.1.4. Data analysis

Descriptive statistics, internal consistency indices, and Pearson's bivariate correlations between all variables were calculated to obtain a description of the sample. For this purpose, the statistical software IBM SPSS (version 23) and Jamovi (version 1.6.23) were used. These results are presented in Table A.2 (Appendices).

The LPA was run to explore the distribution of the participants in terms of their dark personality traits and their sociosexual orientation. Specifically, the four Dark Tetrad traits, assessed using the SD3 and the ASP, and the three unrestricted sex orientation variables, assessed using the SOI-R, were used to obtain the profiles. To reduce the possible influence of measurement errors, standard scores were obtained for all variables and used to run the LPA (Justice et al., 2011).

Models of one to eight profiles were then obtained, fit indices were examined, and the optimal number of profiles was determined based on the best combination of the following criteria: significant values (i.e., $p \leq .05$) on the Likelihood Ratio Test (LRT); smaller values for Log-Likelihood (LL), Akaike Information Criteria (AIC), and Sample Size Adjusted Bayesian Information Criteria (SSA-BIC); entropy values as close to 1 as possible; and no subgroup within each model being represented by less than 5% of participants, as this would indicate that such a subgroup would not be effectively representing a distinct profile (Marsh et al., 2009; Morin et al., 2016).

Although not hypothesised in this study, due to the sample size and the over-representation of women obtained after data collection, the probability (i.e., odds ratios) of belonging to one profile or the other according to sex was estimated. For this purpose, a logistic regression analysis was performed using the three-step method (R3STEP function).

Finally, a multivariate analysis of variance (ANOVA) was run to analyses the differences between the profiles obtained with the LPA in terms of Tinder use motives. For this purpose, the thirteen motives for using Tinder as assessed by the TMS-SF were used. The LPA, the logistic regression, and the ANOVA were run using the statistical program Mplus (version 8.7). For the ANOVA, the BCH method was used to obtain more adjusted results (Asparouhov & Muthén, 2014).

3.2. Results
3.2.1. Latent Profile Analysis

Table 1 shows the eight models that were obtained (one to eight profiles) to analyses the distribution of participants in terms of their dark traits and sociosexual orientation. Considering the fitting criteria for selecting the optimal model, the models of five to eight profiles had to be discarded because the p-value of the LRT did not reach the significance level ($p > .05$). Furthermore, in these four cases the percentage of the smallest subgroup did not reach the optimal number, i.e., 5% representation.

Table 1

Model fit indices for 1- through 8-profile solutions

Profiles	Parameters	LL	AIC	SSA-BIC	LRT p	Entropy	% smallest group
1	14	–	3951.442	3953.265	–	–	–
2	22	-1961.721	3683.442	3686.307	0.0116	0.894	24.75%
3	30	-1819.721	3575.744	3579.650	0.0154	0.813	20.06%
4	38	-1757.872	3500.761	3505.709	0.0102	0.858	4.13%
5	46	-1712.380	3468.909	3474.899	0.2320	0.873	4.20%
6	54	-1688.455	3453.814	3460.846	0.3878	0.835	4.17%
7	62	-1672.907	3453.285	3461.359	0.9375	0.844	3.96%
8	70	-1659.264	3441.279	3450.394	0.5622	0.861	3.06%

Note. LL = Log-Likelihood; AIC = Akaike Information Criteria; SSA-BIC = Sample Size Adjusted Bayesian Information Criteria; LRT = Likelihood Ratio Test.

Following the same criterion, the four-profile model was also discarded for not reaching 5% of participants in the smallest subgroup. Between the two- and three-profile models, the three-profile model was finally selected, considering the combination of the remaining indices, i.e., lower values of LL, AIC, and SSA-BIC, although with a slightly lower entropy.

As a result of the selection of the three-profile model, the following distribution was obtained: 1- A profile of participants characterized by having medium-low scores on the dark traits levels and on the sociosexuality orientation, hereafter referred to as the Non-dark and non-sociosexual profile (41.30% of the sample); 2- A profile characterized by having medium scores on the Machiavellianism and psychopathy levels, but slightly medium-high scores on narcissism and slightly medium-low scores on sadism, and medium-high scores on sociosexuality (being the profile

with the highest scores on sociosexuality), hereafter referred to as the Slightly narcissistic and sociosexual profile (38.60% of the sample); 3- A profile characterized by having high scores on the dark traits levels (being the profile with the highest scores on the Dark Tetrad, especially on psychopathy and sadism) and medium scores on the sociosexuality, although slightly medium-high scores on sociosexual behaviour, hereafter referred to as the High-dark and slightly sociosexual profile (20.10% of the sample). This distribution is shown in Figure 1 and its descriptive statistics can be found in Table 2.

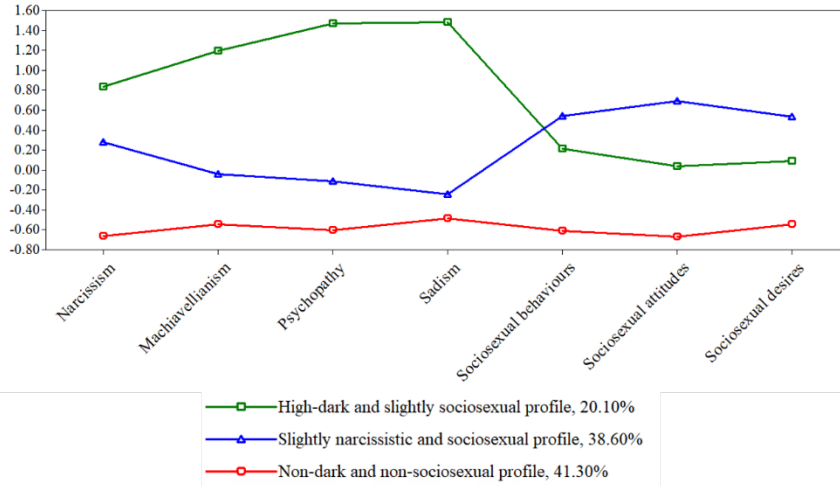**Figure 1**
Profiles of Dark Tetrad and Sociosexual orientation

- High-dark and slightly sociosexual profile, 20.10%
- Slightly narcissistic and sociosexual profile, 38.60%
- Non-dark and non-sociosexual profile, 41.30%

Table 2
Means and standard errors (z scores) for the 3-latent profile analysis

	Profiles					
	Non-dark and non-sociosexual ($n = 80$)		Slightly narcissistic and sociosexual ($n = 79$)		High-dark and slightly sociosexual ($n = 41$)	
	Mean	SE	Mean	SE	Mean	SE
Machiavellianism	-0.55	0.09	-0.04	0.16	1.20	0.18
Narcissism	-0.66	0.09	0.28	0.19	0.83	0.15
Psychopathy	-0.61	0.08	-0.12	0.15	1.47	0.18
Sadism	-0.49	0.06	-0.25	0.10	1.48	0.25
Sociosexual behaviour	-0.61	0.11	0.54	0.19	0.21	0.20
Sociosexual attitude	-0.67	0.25	0.69	0.08	0.04	0.19
Sociosexual desire	-0.55	0.15	0.54	0.15	0.09	0.19

Due to the high percentage of women in the study (67.50%), the probability of belonging to one profile or the other was estimated as a function of gender. Odds ratios (OR) were only significant when comparing the High-dark and slightly sociosexual profile with the Non-dark and non-sociosexual profile, showing that being male could be a qualifying condition in the profile with higher scores on the Dark Tetrad and medium scores on sociosexuality compared to the profile with low scores on both constructs. Specifically, an OR = 3.27 (95% Confidence Interval = 1.35 – 7.91) was obtained, so that men would be up to 3.27 times more likely to belong to the High-dark and slightly sociosexual profile.

3.2.2. Differences between the profiles in terms of Tinder use motives (ANOVA)

Analysis showed statistically significant differences between the latent profiles and the Tinder use motives ($p \leq .001$, $p \leq .01$ and $p \leq .05$). Specifically, significant differences were found for all reasons for use, except for relationship seeking and curiosity. Although there were no differences between the three profiles for any of the eleven variables at the same time, there were differences between at least two of them for these variables. The Non-dark and non-sociosexual profile and the High-dark and slightly sociosexual profile differed the most in terms of reasons for using the app, with fewer differences found between the Slightly narcissistic and sociosexual profile and the High-dark and slightly sociosexual profile (Table 3).

These results revealed that for the respondents of the Slightly narcissistic and sociosexual profile, the main reason for using Tinder is sex, although they also seem to be motivated by more social issues, such as making new friends or travelling. In contrast, for users of the High-dark and slightly sociosexual profile, the main reasons for using Tinder are more related to social approval, being fashionable, decreasing social pressure and improving social skills, although other reasons include distraction and entertainment, and getting over an ex-partner. Finally, although the differences were not significant, compared to the Slightly narcissistic and sociosexual profile and the High-dark and slightly sociosexual profile, the main reason for using Tinder for people in the Non-dark and non-sociosexual profile seems to be the search for romantic relationships.

Table 3

Means and standard errors for motives for Tinder use across latent profiles

Variables	Profiles					
	M (SE)			χ^2		
	1. Non-dark and non-sociosexual (*n* = 80)	2. Slightly narcissistic and sociosexual (*n* = 79)	3. High-dark and slightly sociosexual (*n* = 41)	1 vs. 2	1 vs. 3	2 vs. 3
Social approval	-0.18 (0.12)	-0.13 (0.11)	0.62 (0.18)	0.07	14.20***	11.94**
Relationship seeking	0.06 (0.13)	-0.01 (0.13)	-0.11 (0.15)	0.12	0.69	0.23
Sexual experience	-0.55 (0.11)	0.42 (0.13)	0.23 (0.15)	30.70***	22.41***	0.24
Flirting / social skills	-0.18 (0.11)	0.01 (0.13)	0.36 (0.16)	1.10	7.33**	2.46
Travelling	-0.23 (0.12)	0.18 (0.13)	0.12 (0.15)	4.49*	3.22	0.08
Ex	-0.22 (0.11)	-0.02 (0.13)	0.49 (0.16)	1.13	13.61***	5.78*
Belongingness	-0.24 (0.10)	-0.14 (0.11)	0.76 (0.21)	0.44	19.36***	13.63***
Peer pressure	-0.11 (0.12)	-0.08 (0.13)	0.39 (0.16)	0.03	6.42*	5.03*
Socializing	-0.24 (0.13)	0.24 (0.12)	0.02 (0.15)	6.32*	1.65	1.27
Sexual orientation	-0.37 (0.12)	0.30 (0.13)	0.17 (0.15)	12.65***	8.39**	0.41
Pass time / entertainment	-0.28 (0.13)	0.17 (0.12)	0.25 (0.15)	5.38*	7.35**	0.16
Distraction	-0.35 (0.11)	0.15 (0.13)	0.42 (0.16)	7.27**	16.05***	1.50
Curiosity	-0.19 (0.12)	0.14 (0.13)	0.12 (0.14)	2.88	2.73	0.01

Note. M = Mean; SE = Standard error; χ^2 = chi-square value; Asterisk in χ^2 values refers to groups significantly different: *p < .05, **p < .01, ***p < .001.

4. Discussion

The aim of this study was (1) to validate a brief and psychometrically sound Spanish version of the TMS of Timmermans et al. (2017) and (2) to identify profiles of individuals in terms of their dark traits (i.e., Dark Tetrad) and their sociosexual orientation (i.e., unrestricted sex) to subsequently analyse the differences between the profiles found based on the different reasons for using Tinder.

This study managed to obtain a shorter version of the original version of the TMS (H1 is accepted), the TMS-SF, validated in the Spanish population. Specifically, the 13 different reasons for using Tinder were maintained, but 19 items were eliminated. In fact, the model of the full version of the scale, i.e., the one with 58 items, did not fit well in the Spanish sample, which allowed us to shorten the scale while improving the fit of the factor structure of the model. Given the widespread use and popularity of dating apps, and particularly Tinder, it is essential to know and study the types of uses that people make of these apps, as well as how they relate to others through them (Anzani et al., 2018; Duguay, 2017; Sumter et al., 2017). For this, it is important to have valid and reliable instruments.

In line with previous literature, Tinder users do not use this application solely for the purpose of finding a romantic relationship or having a casual sexual encounter (Gudelunas, 2012; Phan et al., 2021; Sumter et al., 2017; Sumter & Vandenbosch, 2019; Timmermans & De Caluwé, 2017; Van De Wiele & Tong, 2014; Wu & Trottier, 2022). The participants in this study seem to be motivated by the 13 different reasons for use, present in the TMS-SF (H2 is accepted) (Timmermans & De Caluwé, 2017). Many of these individuals use the app for other purposes, such as socialising, entertainment, or simple curiosity. Studying the different reasons for use can help to understand the

behaviours and outcomes of Tinder use, as well as to better understand the characteristics of those who use these apps (Timmermans & De Caluwé, 2017). Ultimately, knowing how and why people use these apps is essential to understand and anticipate possible consequences of their use (Castro & Barrada, 2020).

Based on the idea that dark personality and sociosexual orientation may guide motivations to use apps such as Tinder (Lyons et al., 2022; Sevi, 2019; Sumter & Vandenbosch, 2019; Timmermans et al., 2018), the present study sought to identify profiles of individuals based on Dark Tetrad traits and unrestricted sexuality and then analyse the differences between them in terms of Tinder usage motives. As a result, contrary to expectations, the LPA yielded a three-profile model (H3 is rejected). Although this is the first study that aims to identify profiles based on these variables, in line with previous results that have obtained positive relationships between both variables, we did obtain a profile characterised by low scores on both the Dark Tetrad and sociosexual orientation (the Non-dark and non-sociosexual profile); in contrast, we did not obtain an opposite classification, i.e., a group with high scores on both constructs (Burtaverde, 2021; Lechuga & Jones, 2021; Malesza & Kaczmarek, 2021; Sevi, 2019).

Instead, in contrast to what was expected, a profile was obtained with average scores on the Dark Tetrad, although slightly high on narcissism and slightly low on sadism, and with the highest scores on sociosexual orientation (the Slightly narcissistic and sociosexual profile). It seems that the profile of people with a less restrictive sociosexual orientation (i.e., who allow themselves to have a greater number of uncommitted sexual relationships, for short periods of time and with different people) do not seem to be the people with a greater presence of dark traits, although they do seem to be slightly narcissistic. Several studies have found that the trait with the strongest magnitude of association with sociosexuality is psychopathy, followed by Machiavellianism (Burtaverde, 2021; Lechuga & Jones, 2021; Malesza & Kaczmarek, 2021; Sevi, 2019). However, in the study conducted by Lechuga y Jones (2021), in which women were asked to rate the attractiveness of men on Tinder with Dark Triad traits, it was obtained that the profile of narcissistic men was seen as the most attractive by women with higher sociosexuality (there was only an association between the narcissistic profile and sociosexuality). Along these lines, in the present study the highest scores were obtained for the narcissistic trait, and it was this trait that presented the strongest magnitude correlations with sociosexuality.

We also found an unexpected profile with the highest scores in the Dark Tetrad, especially in psychopathy and sadism traits, but with average scores in sociosexual orientation, although slightly elevated in sociosexual behaviour (the High-dark and slightly sociosexual profile) (Burtaverde, 2021; Lechuga & Jones, 2021; Malesza & Kaczmarek, 2021; Sevi, 2019). Apparently, the profile of people with more narcissistic, Machiavellian, psychopathic and sadistic traits does not seem to be the people with the least restrictive sociosexual orientation.

Previous studies have found higher scores on dark traits in Tinder users than in non-users (Freyth & Batinic, 2021; Sevi, 2019). However, the results of this study have shown that there does appear to be a group of Tinder users who have low scores on dark traits and sociosexuality. This profile is also the most represented by the study participants (41.30%). In line with our predictions, this profile seems to be the least motivated to use Tinder for sexual, social approval, distraction, and entertainment purposes (H4 is accepted). Consistent with prior research, sexual motives were expected to be one of the main reasons why people with high scores on the Dark Tetrad use Tinder, but search for a romantic relationship was not (Freyth & Batinic, 2021; Lyons et al., 2022; Timmermans et al., 2018). While the variations between profiles were not statistically significant regarding the search for a romantic relationship variable, it is noteworthy that this profile displayed the highest mean. Consequently, it appears that seeking a romantic relationship remains the primary motivation for using Tinder among these individuals.

Of the other two profiles, the Slightly narcissistic and sociosexual profile was the one with the highest scores on unrestricted sex orientation. Therefore, although previous studies have concluded that both dark personality and sociosexuality are variables with a relevant role in the motivation to use Tinder for sexual purposes (e.g., Sevi, 2019), in this study, sociosexuality emerges as a more influential factor in shaping the motives for the app usage. This same profile seems to be the most motivated to use Tinder for the purpose of, for example, having casual sex with different

people. The High-dark and slightly sociosexual profile, on the other hand, seems to be more motivated to use the app for social approval, to be fashionable, to decrease social pressure, to improve social skills, and for distraction, entertainment and to get over an ex-partner. Lyons et al. (2022) found in their study that Machiavellianism was the Dark Tetrad trait that predicted these motives.

Previous studies have found that people with Dark Tetrad traits seem to use Tinder especially for sexual and social approval motives, as well as motives related to distraction and entertainment (Freyth & Batinic, 2021; Lyons et al., 2022; Timmermans et al., 2018). In this sense, our results do seem to be along these lines, as the High-dark and slightly sociosexual profile presented the highest means for these reasons for use, except, as mentioned above, for sexual motives. Again, in this study, it seems that dark personality was a more important variable for these reasons for use.

This study also showed that being male could be a classification condition in the High-dark and slightly sociosexual profile, i.e., males are more likely to belong to this group compared to the Non-dark and non-sociosexual profile. Since OR played no role in the differentiation between the Slightly narcissistic and sociosexual profile and the High-dark and slightly sociosexual profile (where differences between scores on the Dark Tetrad and sociosexuality are apparent), it could be expected that these results are because men generally score higher on the Dark Tetrad traits (Chabrol et al., 2009; Muris et al., 2017). In line with these results, Sevi et al. (2019) examined the possible moderating effect of sex on differences in Dark Triad traits and sociosexuality between Tinder users and non-users and found no significant effect.

In this study, an innovative methodology was used to identify groups of people on the basis of their scores on the different scales simultaneously (Williams & Kibowski, 2015). Therefore, the results of this study have provided an interesting classification into three profiles contrary to expectations, i.e., a profile with low scores on the Dark Tetrad and sociosexuality and a profile with high scores on both constructs. Likewise, we obtained profiles that allowed us to see a different distribution of participants and to see how these profiles are motivated by different purposes when using the Tinder application.

Specifically, the results of this study have allowed us to observe that people with less dark traits and less sociosexual orientation seem to be the least motivated to use Tinder for a purpose other than finding a romantic partner; that people with slightly high scores on dark traits and high scores on sociosexual orientation will be the most motivated to use Tinder for sexual purposes; and that people with the highest scores on dark traits and slightly high scores on sexual orientation will be the most motivated to use Tinder for a variety of utilitarian purposes, such as gaining social approval, improving their social and flirting skills, reducing social pressure and being fashionable, entertainment, and getting over an ex-partner. It seems, therefore, that the people most interested in using Tinder for sexual purposes are those with moderate scores on the Dark Tetrad traits and not those with the highest scores. These findings align with the definition of Dark Tetrad traits, particularly due to their shared underlying element of insensitive manipulation. Furthermore, as noted by Jonason et al. (2013) in their study, people with these personality traits are characterised by volatile relationships with others and may actively seek sporadic romantic/sexual relationships. As a result, these motives can prove to be highly relevant and informative in this context (Paulhus, 2014; Paulhus & Williams, 2002).

4.1. Limitations and future lines of research

Concerning the limitations of the study, it is worth mentioning those relating to the sample size, the over-representation of women, the type of sample and the cross-sectional design, which hinder the generalizability of the results. As a future line of research, it is proposed to replicate this study with a larger sample size and a longitudinal design to obtain more evidence of the results obtained, as well as to replicate it in different countries and cultures to analyse the extent of the generalizability of these results.

Furthermore, although a recent systematic review indicated that dating apps are used regardless of gender, age, marital status, sexual orientation, education and income level (Castro & Barrada, 2020), some studies have found differences between men and women in the reasons for using Tinder (e.g., Lyons et al., 2022). Therefore, it would be interesting to replicate the LPA with a larger sample size to obtain a model of profiles for women and another for men and thus allow us to analyse possible differences between them in terms of reasons for use.

4.2. Conclusions

Dating apps have increased in use and popularity in recent years, changing the way people interact, meet and establish new romantic relationships (Anzani et al., 2018; Duguay, 2017; Sumter et al., 2017). Tinder seems to be one of the most consumed apps by the population, but it does not seem to be used solely for the purpose of finding a romantic partner. Its users have used it for other motivations, such as casual sex, making new friends, gaining social approval, distraction, or entertainment, in addition to other reasons (Gudelunas, 2012; Phan et al., 2021; Sumter et al., 2017; Sumter & Vandenbosch, 2019; Timmermans & De Caluwé, 2017; Van De Wiele & Tong, 2014; Wu & Trottier, 2022).

Understanding the different reasons why people use dating apps, as well as the characteristics of these people (such as their personality), is relevant for analysing the positive and negative effects of their use. These apps can have advantages, such as easy access to a multitude of potential partners and ease of meeting people, but also disadvantages, such as loss of intimacy and privacy; moreover, they can also present risks, such as sexual victimisation (Castro & Barrada, 2020). Taking into consideration the positive relationship between Dark Tetrad traits and a wide range of antisocial behaviours, such as sexual aggression, it seems crucial to know what motivates people who are less sexually restricted and display more undesirable personality traits to use Tinder. This could help in the design of more targeted prevention programmes to mitigate the misuse of dating apps, as well as to raise awareness about contacting people through these apps for different reasons.

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Supplementary information

Table A.1

Means, standard deviations, and reliability coefficients for the Tinder Motives Scale-Short Form (39-items TMS-SF)

	1	2	3	4	5	6	7	8	9	10	11	12	13
1	1												
2	.14*	1											
3	.35**	.08	1										
4	.50*	.14*	.39**	1									
5	.10	.03	.30**	.14*	1								
6	.28**	.22**	.27**	.18**	.08	1							
7	.52**	.13	.33**	.43**	.25**	.41**	1						
8	.28**	.20**	.17**	.37**	.18**	.26**	.53**	1					
9	.19**	.16*	.21**	.33**	.49**	.14*	.29**	.24**	1				
10	.26**	.22**	.52**	.33**	.25**	.29**	.18**	.14*	.33**	1			
11	.25**	.13	.26**	.33**	.18**	.20**	.28**	.19**	.39**	.42**	1		
12	.48**	.19**	.38**	.49**	.22**	.27**	.44**	.30**	.32**	.35**	.52**	1	
13	.30**	.11	.26**	.38**	.19**	.22**	.32**	.32**	.35**	.34**	.44**	.42**	1
M	2.50	3.65	2.98	2.78	3.14	2.65	1.80	2.41	3.96	3.75	4.05	2.54	4.10
SD	1.65	1.86	1.68	1.77	1.97	1.88	1.31	1.62	1.86	2.02	1.98	1.62	1.85
α	.92	.91	.80	.91	.94	.98	.93	.83	.84	.94	.92	.84	.86
ω	.92	.92	.81	.92	.94	.98	.93	.86	.86	.95	.92	.86	.88
CR	.92	.92	.80	.92	.94	.98	.94	.87	.86	.95	.92	.87	.88
AVE	.79	.80	.58	.79	.85	.94	.81	.69	.67	.86	.79	.67	.72

Note. 1 = Social approval; 2 = Relationship seeking; 3 = Sexual experience; 4 = Flirting / social skills; 5 = Travelling; 6 = Ex; 7 = Belongingness; 8 = Peer pressure; 9 = Socializing; 10 = Sexual orientation; 11 = Pass time / entertainment; 12 = Distraction; 13 = Curiosity.; α = Cronbach's alpha; ω = McDonald's omega; AVE = Average Variance Extracted; CR = Composite Reliability.

Table A.2

Descriptive statistics, reliability indices, and correlations among adolescent variables

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
1	1																			
2	.48**	1																		
3	.51**	.54**	1																	
4	.40**	.51**	.79**	1																
5	.28**	.19**	.25**	.12	1															
6	.21**	.20**	.16*	.04	.50**	1														
7	.25**	.18*	.12	.02	.36**	.48**	1													
8	.16*	.20*	.26**	.18*	.10	.00	.11	1												
9	-.05	.01	-.03	.00	-.12	-.14	-.04	.15*	1											
10	.28**	.23**	.22**	.16*	.32**	.36**	.37**	.37**	.12	1										
11	.12	.17*	.22**	.16*	.02	.10	.15*	.50**	.17*	.38**	1									
12	.19**	.05	.02	-.04	.15*	.11	.07	.08	.05	.29**	.10	1								
13	.16*	.29**	.19**	.12	.04	.05	-.01	.31**	.26**	.26**	.18**	.08	1							
14	.25**	.27**	.29**	.25**	-.04	-.03	.05	.57**	.15*	.33**	.45**	.24**	.43**	1						
15	.23**	.20**	.16*	.14	-.11	-.06	.09	.30**	.18*	.19**	.38**	.19**	.30**	.54**	1					
16	.14*	.05	-.01	-.05	.08	.14	.15*	.19**	.16*	.22**	.31**	.46**	.17*	.30**	.24**	1				
17	.19**	.24**	.06	.05	.24**	.28**	.20**	.24**	.25**	.53**	.33**	.23**	.30**	.20**	.15*	.30**	1			
18	.02	.20**	.11	.11	.14	.14	.07	.25**	.13	.29**	.37**	.17*	.20**	.30**	.21**	.37**	.39**	1		
19	.16*	.16*	.27**	.21**	.17*	.15*	.11	.50**	.22**	.40**	.57**	.21**	.29**	.47**	.30**	.32**	.33**	.49**	1	
20	.12	.11	.02	.05	-.04	.08	-.05	.30**	.15*	.26**	.39**	.16*	.22**	.35**	.36**	.33**	.31**	.40**	.39**	1
M	12.57	11.85	7.66	4.54	13.95	18.07	10.75	7.38	10.99	8.89	8.33	9.60	7.93	5.50	7.29	12.19	11.36	12.25	7.42	12.33
SD	5.06	6.62	5.30	5.05	7.03	6.85	5.83	4.89	5.55	5.15	5.37	5.96	5.60	4.05	4.91	5.64	6.12	5.94	4.82	5.62
α	.49	.77	.66	.78	.88	.76	.89	.92	.91	.80	.92	.94	.98	.92	.83	.85	.94	.92	.83	.86
ω	.58	.79	.74	.85	.89	.76	.89	.92	.91	.81	.92	.94	.98	.93	.85	.85	.95	.92	.85	.88

Note. 1 = Narcissism; 2 = Machiavellianism; 3 = Psychopathy; 4 = Sadism; 5 = Sociosexual behaviour; 6 = Sociosexual attitude; 7 = Sociosexual desire; 8 = Social approval; 9 = Relationship seeking; 10 = Sexual experience; 11 = Flirting/social skills; 12 = Travelling; 13 = Ex; 14 = Belongingness; 15 = Peer pressure; 16 = Socializing; 17 = Sexual orientation; 18 = Pass time/entertainment; 19 = Distraction; 20 = Curiosity; α = Cronbach's alpha; ω = McDonald's Omega; * $p < .05$. ** $p < .01$.

Appendix 5

Study 5

The Dirty Twenty: A brief Spanish measure for assessing the Dark Tetrad of personality

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The Dirty Twenty: A brief Spanish measure for assessing the Dark Tetrad of personality

Abstract

Based on the limited evidence of the validity of the Spanish versions for assessing the Dark Tetrad, three studies were designed to validate a brief measure based on two of the most used scales, i.e., Short Dark Triad (SD3) and Assessment of Sadistic Personality (ASP): The Dirty Twenty (D20). 1188 participants took part in Study 1, assessing the factor structure, internal consistency, and criterion validity of this scale as well as of the original scale that precedes D20, i.e., the combination of the SD3 and the ASP. In the second study, with 76 participants, aimed to evaluate test-retest reliability, good reliability indices were found. And construct validity was further assessed in Study 3 with 137 participants by comparing the D20 with the Short Dark Tetrad. In conclusion, we offer the D20, a concise, reliable, and valid measure for assessing the Dark Tetrad of personality.

Key words: Dark Triad, Dark Tetrad, personality, assessment, validation.

Introduction

When we intend to understand and explain the causes of different antisocial behaviors from an individual perspective, we tend to think about characteristics of personality such as malice, deceit, impulsiveness, or egocentrism among many others (Muris et al., 2017). The first approach to this malevolence construct from the trait theory was proposed by Paulhus and Williams (2002), giving it the name of the "Dark Triad". This first approach to the construct of malevolence included three traits: narcissism, which is defined as a mixture of vanity and egocentric admiration of one's own qualities that has a negative impact on relationships with other people; Machiavellianism, which refers to a deceptive interpersonal style characterized by a cynical disregard for morality and a focus on self-interest and personal gain; and psychopathy, which is concerned with antisocial behavior, diminished empathy and remorse, and uninhibited and reckless behavior, sometimes covered by a veil of superficial charm (Paulhus & Williams, 2002).

Since that approach to the construct was proposed, there is increasing research every year interested in these traits (e.g., Chabrol et al., 2017; Dinic & Jevremov, 2021; Pechorro et al., 2022). Researchers studying these dark traits have resorted to self-report scales to independently measure this set of "malevolent" traits (Pineda et al., 2020). However, to assess these constructs jointly, basically, two questionnaires were developed: the Dark Triad Dirty Dozen (DTDD; Jonason and Webster., 2010) and the Short Dark Triad (SD3; Jones and Paulhus, 2014). Both scales have also been adapted and validated in Spanish (Pineda et al., 2020), Turkish (Özsoy et al., 2017), or Serbian (Dinic et al., 2018) among others. Although these scales have been widely used, they are not without some limitations. For example, in the Spanish adaptation of the SD3, it was found that some of the items, mainly the inverted items, did not work well. Notwithstanding, the authors opted to keep them to be able to make cross-cultural comparisons with other versions (Pineda et al., 2020).

On the other hand, to expand and complete these dimensions of dark personality, several traits have been proposed that could somehow be part of these core of malevolent traits, such as everyday sadism, spitefulness, or moral detachment among others (e.g., Marcus et al., 2014; Moshagen et al., 2018). Among all of them, there is consensus that sadism could be the fourth element that would conform the Dark Tetrad of Personality (Chabrol et al., 2009). However, it is worth mentioning that although different traits, all these constructs would have in common several characteristics such as callousness, aggressiveness, lack of sensitivity towards others, interpersonal manipulation, or social dominance orientation among other pervasive characteristics (e.g., Jones & Figueredo, 2013; Marcus et al., 2018; Paulhus, 2014).

Everyday sadism would classically define a person who enjoys humiliating others, showing a persistent pattern of cruel or degrading behavior toward others, or intentionally inflicting physical, sexual, or psychological pain or suffering to assert power and dominance over others or for simple pleasure and enjoyment (O'Meara et al., 2011). In the present article and with the perspective of integrating the different conceptualizations developed over the everyday sadism construct, (e.g., O'Meara et al., 2011; Plouffe et al., 2017) although relying mainly on the definition given by Foulkes (2019), we conceptualize it as the experience of hedonic value understood as the obtaining of pleasure or a certain feeling of enjoyment, or a sense of control derived from seeing or causing harm to other people.

Although some measures were already available to assess this construct, the truth is that none of them could do so jointly, as they did not fit the response format of the available measures of the triad (DD and SD3). Therefore, Plouffe et al. (2017) developed the Assessment of Sadistic Personality (ASP) as a measure of sadism that could be used together with the already existing SD3, creating a combination of two scales to assess the traits of the Dark Tetrad together, with a total of 36 items: SD3 together with ASP. This aspect was also reflected in other works such as in the validation of the Spanish version of ASP (Pineda et al., 2021).

Subsequently, the original authors of the Dark Triad construct, together with others, developed a scale aimed at measuring the Dark Tetrad (officially assigned as the Short Dark Tetrad, SD4; Paulhus et al., 2021). This scale presents good psychometric properties; however, since it is based on a different item pool than the one used in previous research (the one obtained from the union of the SD3 and ASP scales), it can measure slightly different constructs than the ones assessed previously. For example, Paulhus et al. (2021) with the objective of distinguishing to a greater extent

the psychopathy and Machiavellianism constructs, the SD4 conceptualizes this last one more using controlled manipulation instead of aggressiveness; or paying more attention to the vicarious dimension of sadism.

The present studies

Based on the previous introduction and the limited evidence of the validity of the Spanish versions for assessing the Dark Tetrad, the main objective of these studies is to offer a brief but valid and reliable measure to assess the Dark Tetrad of personality; as well as to provide further evidence on the psychometrics of the, previously used, Spanish version of the 36 items scale to assess the dark personality construct (based on the combination of the SD3 and the ASP). Furthermore, with the objective of connecting previous research conducted with the combination of SD3 and ASP with those studies developed using the SD4, we also expect to find high correlations between these scales, proving their validity in assessing the Dark Tetrad traits.

Study 1

The main aim of the first study is, by following the principle of parsimony (Vandekerckhove et al., 2015) to provide a brief measure to evaluate the Dark Tetrad in the Spanish population —The Dirty Twenty (D20)— in order to provide a measure that allows to measure the traits of the Dark Tetrad jointly from one of the two most used scales in this field: SD3 and ASP, following the indications of Plouffe et al. (2017). As a secondary objective, we also aim to explore the psychometric properties of the psychometric properties of the combination of these scales (i.e., the SD3 and the ASP) in their full versions, i.e., the combination comprising the 36 items, as Plouffe et al. (2017) proposed.

We expect to obtain reliable measures with a four-factor structure as shown in previous studies using the 36-item version (e.g., Pineda et al., 2023). Furthermore, as to the validity of the scale, we expect to find direct moderate to large correlations with other scales designed to evaluate everyday sadism, the Dark Triad, and some subscales from the Strengths and Difficulties Questionnaire (SDQ) designed to measure different emotional and behavior problems (e.g., Papageorgiou et al., 2020; Pineda et al., 2020, 2021). On the contrary, we hypothesize that similar, but negative, moderate to large correlations will be found between our Dark Tetrad scale and the HEXACO subscales, such as honesty-humility, emotionality, agreeableness, or conscientiousness (e.g., Naor-Ziv, et al., 2022; Schreyer et al., 2021); and the prosocial subscale of the SDQ. As in previous research conducted on the Dark Triad and everyday sadism, we expect men to score higher on these traits than women (e.g., Paulhus et al., 2021; Pineda et al., 2020, 2021).

Materials and Methods

Participants and procedure

A large sample of participants ($N = 1188$) from all over Spain participated in the study. The mean age was 29.30 ($SD = 10.26$), with an age range between 13 and 69 years, and 78.10% ($n = 928$) were women. Although the country of birth of some of the participants was not Spain (10.77%), all of them were Spanish speakers. Most of them had university studies ($n = 734$; 61.80%).

Participants were recruited by the convenience sampling method between the months of November and December 2019 through the Internet. For this purpose, the online survey was disseminated among the participants through social networks, such as Instagram, Facebook, and Twitter. Participants did not receive any compensation for their participation in the study. To determine the sample size, we assigned several observations 6 to 10 times larger than the variables (Velicer & Fava, 1998). Consequently, the required sample ranged from 942 to 1570 participants, depending on the number of items in all self-reports administered.

To carry out the study, the Research Ethics Committee of the University approved the project (DPS.JPR.04.16). Participants gave their informed consent to participate in the study when they clicked on the survey link.

Instruments

Short Dark Triad (SD3) and Assessment of Sadistic Personality (ASP)

The SD3 (Jones & Paulhus, 2014) is a 27-item scale which assess the three traits of the Dark Triad, i.e., narcissism, Machiavellianism, and psychopathy; and the ASP (ASP; Plouffe et al., 2017) is a 9-item scale which assess everyday sadism. The combination of the two scales (Plouffe et al., 2017), used to measure the Dark Tetrad traits (narcissism, Machiavellianism, psychopathy, and

sadism), forms a scale with a of 36 items, 9 per factor, which are answered on a 5-point Likert-type scale (from 0 = *strongly disagree* to 4 = *strongly agree*). Both the SD3 and the ASP have Spanish versions with acceptable psychometric properties: a Cronbach's alpha (α) of .61, .73, .68, and .75 for narcissism, Machiavellianism, psychopathy, and sadism, respectively; and a McDonald's omega (ω) of .60, .69, .65, and .75 for narcissism, Machiavellianism, psychopathy, and sadism, respectively (Pineda et al., 2020, 2021). The combination of both instruments to measure the Dark Tetrad with a Spanish sample has been widely used (e.g., Fernández Del Río et al., 2019; Pineda et al., 2021, 2023).

Dark Triad Dirty Dozen (DTDD)

The DD (Jonason & Webster, 2010) is a scale that measures, like the SD3, the three traits of the Dark Triad: narcissism, Machiavellianism, and psychopathy. It is composed of 12 items (four per trait) and is answered on a 5-point Likert-type scale: from 0 (*strongly disagree*) to 4 (*strongly agree*). The Spanish version of the scale presents adequate psychometric properties, with an α = .81 and a ω = .82 for narcissism, and an α and ω of .74 for Machiavellianism, although with an α = .60 and a ω = .47 for psychopathy (Pineda et al., 2020). Table 5 presents the internal consistencies of the present sample.

Short Sadistic Impulse Scale (SISS)

The SISS (O'Meara et al., 2011) is a measure designed to measure inclination to sadistic impulse. It contains a single scale that is answered with 10 items and employs 5-point Likert-type responses (from 0 = *strongly disagree* to 4 = *strongly agree*). The Spanish version presents good internal consistency indices: α = .78 and a ω = .76 (Pineda et al., 2021). Psychometric properties for the present sample are shown in Table 5.

HEXACO-60 Personality Inventory-Revised (HEXACO-60)

The HEXACO (Ashton & Lee, 2009) is a scale that measures the six major personality traits: honesty-humility, emotionality, extraversion, agreeableness, conscientiousness, and openness to experience. It is composed of a total of 60 items (10 per dimension), which are answered on a 5-point Likert-type scale: from 1 (*strongly disagree*) to 5 (*strongly agree*). The 100-item version of this scale was adapted to Spanish sample and presented adequate psychometric properties, with an α between .77 and .84 for the subscales (Roncero-Sanchís et al., 2013). For this study, the 60-item version translated by Belloch, published online (https://hexaco.org/downloads/Spanish_self60_Belloch.doc), was used. Table 5 presents the reliability indices for the present sample.

Strengths and Difficulties Questionnaire (SDQ)

The SDQ (Goodman, 1997) is an emotional and behavioral assessment scale that measures strengths and difficulties through five subscales: emotional symptoms, conduct problems, hyperactivity/inattention, peer relationship problems, and prosocial behavior (the latter corresponds to strengths). It is composed of 25 items, 5 per subscale, which are answered on a 3-point Likert-type scale: 0 = *not true*, 1 = *somewhat true*, and 2 = *certainly true*. For this study we used the Spanish version downloaded from the official website of the scale (https://www.sdqinfo.org/a0.html), which has been previously used with a Spanish sample and has presented adequate psychometric properties (α between .69 and .78) (e.g., Ortuño-Sierra et al., 2015). Table 5 presents the internal consistencies of the present sample.

Data analysis

On the one hand, the Confirmatory Factor Analysis (CFA) were performed with the R statistical program (R Core Team). To estimate the factor loadings accurately, Diagonally Weighted Least Squares (DWLS) was selected, and to consider a good fit of the model the following fit indices were considered: a significant ($p < .05$) chi-square ($\chi2$) value, a Normalized Fit Index (NFI) value greater than .90, a Comparative Fit Index (CFI) greater than or equal to .95, a Goodness of Fit Statistic (GFI) value greater than or equal to .90, a value for the Standardized Root Mean Residual (SRMR) equal to or less than .05, and a value for the Root Mean Square Error Approximation (RMSEA) equal to or less than .08 (Hu & Bentler, 1999; Kline, 2011).

On the other hand, descriptive statistics (i.e., mean and standard deviation), gender differences (i.e., Student's t-test), and Pearson correlations between variables were obtained using the SPSS statistical program (version 25). To obtain gender differences, Cohen's d was also calculated to obtain an effect size and an online program

(https://www.easycalculation.com/es/statistics/effect-size.php) was used for this purpose. For Student's *t*, it was interpreted using the Bonferroni correction to obtain more accurate results (a significant effect was $p < .0125$, because of dividing the alpha (i.e., .05) by the number of analyses performed (i.e., four)). Cronbach's Alpha and McDonald's Omega reliability indices were obtained with the Jamovi program (version 2.2.5). Finally, to obtain the fit indices to analyze the factorial invariance across gender, the R program was used again and the values of χ^2, CFI, ΔCFI (Difference in Comparative Fit Index), RMSEA, ΔRMSEA (Difference in Root Mean Square Error Approximation), and degrees of freedom (df) were considered.

Table 1. Factor structures of the combination of the Short Dark Triad (SD3) and the Assessment of Sadistic Personality (ASP) in its short (Dirty Twenty —D20) and full (SD3 + ASP) version

Item	D20 / SD3 + ASP			
	Narcissism	Machiavellianism	Psychopathy	Sadism
SD3_01		–/.11		
SD3_02		.66/.66		
SD3_03		.69/.70		
SD3_04		–/.39		
SD3_05		.70/.71		
SD3_06		.75/.74		
SD3_07		.56/.59		
SD3_08		–/.52		
SD3_09		–/.46		
SD3_10	.48/.50			
SD3_11	–/.22			
SD3_12	.56/.56			
SD3_13	.55/.60			
SD3_14	.53/.54			
SD3_15	–/.11			
SD3_16	.44/.44			
SD3_17	–/.29			
SD3_18	–/.33			
SD3_19			.59/.60	
SD3_20			–/.17	
SD3_21			.57/.57	
SD3_22			–/.51	
SD3_23			.65/.66	
SD3_24			.70/.71	
SD3_25			–/.12	
SD3_26			–/.37	
SD3_27			.62/.64	
ASP_01				.63/.63
ASP_02				–/.59
ASP_03				.72/.72
ASP_04				.67/.67
ASP_05				.68/.67
ASP_06				–/.54
ASP_07				–/.58
ASP_08				.71/.70
ASP_09				–/.20

Note. only the five items with the highest factor loadings are shown in the D20.

Results

Confirmatory Factor Analysis (CFA) of the Dirty Twenty (D20), the new brief measure

The D20 was constructed from the items pool from the combination of the SD3 and the ASP following the indications of Plouffe et al., (2017) (in order not to confuse the reader, hereafter, this short version of the combination of these scales will be referred to as D20; the long combination of

both scales that make up the original 36 items will be referred to as SD3 + ASP). For this purpose, a CFA was performed and the factor loadings of the 36 items were obtained (nine per subscale for the four traits of the Dark Tetrad). After ordering these loadings from highest to lowest for each trait, the four with the lowest loadings within each trait were excluded (following the principle of parsimony; Vandekerckhove et al., 2015), so 16 items were excluded, and five items were left for each subscale. All inverse items were excluded. Table 1 shows those five items selected with the highest loadings for each trait.

From the CFA of the 20-item scale of the D20, with the four factors, the following fit indices were extracted: $\chi 2$ = 295.472, DF = 164, *p* < .000, NFI = .976, GFI = .987, CFI = .989, SRMR = .041, RMSEA = .026. For the combination of SD3 and ASP, from the CFA of these scales and the four traits, the following fit indices were extracted: $\chi 2$ = 1541.616, DF = 588, *p* < .001, NFI = .931, GFI = .964, CFI = .956, SRMR = .051, RMSEA = .037. For both cases, the fit indices indicated a good fit for the models. Table 1 shows the standardized factor loadings for the items of the two scales.

Descriptive statistics and factorial invariance across gender for the D20

The descriptive statistics (means, standard deviations, gender differences, and reliability coefficients) of this brief version (i.e., the D20) are presented in Table 2. The highest scores have been obtained on narcissism and Machiavellianism traits, with males presenting significantly higher scores than females on all four traits of both versions ($p \leq .0125$ with Bonferroni fit). Regarding reliability indices, an α between .64 and .81 and a ω between .64 and .82 have been obtained in the subscales of the D20; and an α between .65 and .80 and a ω between .66 and .84 in the subscales of the long combination of SD3 + ASP. Both scales present acceptable internal consistency indices, although, in the case of narcissism, they are somewhat weak in both versions.

Table 2. Means (standard deviations), gender differences, and reliability coefficients (Cronbach's alphas and McDonald's omegas) for the combination of the Short Dark Triad (SD3) and the Assessment of Sadistic Personality (ASP) in its short (Dirty Twenty —D20) and full (SD3 + ASP) version

	Total group (*N* = 1188)	Women (*n* = 928)	Men (*n* = 260)	*t*	*d*	α	ω
D20							
Narcissism	6.50 (3.49)	6.12 (3.38)	7.83 (3.54)	-7.13*	0.49	.64	.64
Machiavellianism	6.29 (4.24)	5.84 (4.18)	7.93 (4.08)	-7.17*	0.51	.80	.81
Psychopathy	3.72 (3.54)	3.36 (3.37)	5.00 (3.81)	-6.71*	0.46	.76	.77
Sadism	1.80 (2.91)	1.50 (2.58)	2.86 (3.68)	-6.78*	0.43	.81	.82
SD3 + ASP							
Narcissism	12.79 (5.09)	12.29 (5.01)	14.56 (5.00)	-6.47*	0.45	.65	.66
Machiavellianism	14.52 (6.35)	13.86 (6.33)	16.86 (5.87)	-6.87*	0.49	.80	.81
Psychopathy	7.18 (5.25)	6.46 (4.95)	9.76 (5.51)	-9.24*	0.63	.72	.75
Sadism	3.69 (4.53)	3.17 (4.02)	5.55 (5.63)	-7.68*	0.49	.80	.84

Note. *t* = Student's t; *d* = Cohen's d; α = Cronbach's alpha; ω = McDonald's omega; **p* < .0125 (Bonferroni fit).

Given the good model fit of the 20-item version and its similar internal consistency indices with the original 36-item version, the factorial invariance analysis between genders was obtained for this version (i.e., for the D20), which is presented in Table 3. Specifically, the fit indices for the invariance models that allowed testing whether the factor structure of the scale was equivalent across genders are presented. As a result, evidence of structural factorial invariance in the model was obtained for all genders and the Spanish version of the D20 achieved strong factorial invariance between genders.

Bivariate Correlations of the D20 and the SD3 + ASP, and the study variables (convergent and divergent validity)

Table 4 presents the bivariate correlations between the Dark Tetrad traits for each of the two scales (20-item D20 and 36-item SD3 + ASP) and between them. In both cases, the traits correlated positively and significantly with each other (*p* < .01), with moderate magnitudes. Correlations were also found between the traits of both scales (*p* < .01), with strong magnitudes for the same trait measured with both scales.

Table 3. Factorial invariance across gender for the Dirty Twenty (D20)

Invariance level	Fit indices					
	χ2	df	CFI	ΔCFI	RMSEA	ΔRMSEA
Configural	–	328	0.995	–	0.017	–
Weak	50.42	344	0.992	0.003	0.021	0.004
Strong	41.36	360	0.989	0.002	0.023	0.002
Strict	419.16	364	0.951	0.038	0.050	0.026

Note. χ2 = chi-square value; df = degrees of freedom; CFI = Comparative Fit Index; ΔCFI = Difference in Comparative Fit Index; RMSEA = Root Mean Square Error Approximation; ΔRMSEA = Difference in Root Mean Square Error Approximation.

Table 4. Bivariate correlations between the combination of the Short Dark Triad (SD3) and the Assessment of Sadistic Personality (ASP) in its short (Dirty Twenty —D20) and full (SD3 + ASP) version

D20	D20				SD3 + ASP			
	N	M	P	S	N	M	P	S
N	1							
M	.39**	1						
P	.39**	.63**	1					
S	.26**	.45**	.56**	1				
SD3 + ASP								
N	.88**	.35**	.36**	.24**	1			
M	.40**	.93**	.60**	.41**	.33**	1		
P	.37**	.56**	.90**	.54**	.37**	.51**	1	
S	.26**	.44**	.56**	.91**	.26**	.39**	.55**	1

Note. N = Narcissism; M = Machiavellianism; P = Psychopathy; S = Sadism; **$p < .01$

In turn, Table 5 presents the bivariate correlations between the dark traits of both scales (D20 and SD3 + ASP again) and the other study variables, to test the convergent and divergent validity of both scales. As for the Dark Tetrad traits measured with the other instruments (DTDD and SISS), significant ($p < .01$) and positive correlations were obtained with all traits. Significant correlations ($p < .01$ and $p < .05$) were also obtained with the personality traits of the HEXACO model, except with openness to experience in the case of Machiavellianism and sadism (in both scales of the Dark Tetrad), and with agreeableness and conscientiousness in the case of narcissism (in the first case in the D20 and in the second case in the SD3 + ASP). The relationships with the HEXACO traits are in the negative direction except between narcissism and extraversion and openness to experience.

As for the SDQ variables, all the correlations obtained were significant ($p < .01$ and $p < .05$) except between narcissism and prosocial behavior. All four traits correlated positively with the SDQ variables, except narcissism with emotional symptoms and relationship problems, and Machiavellianism, psychopathy, and sadism with prosocial behavior, which correlated negatively. In general, the correlations obtained between the study variables and the dark traits measured with the D20 and the SD3 + ASP are very similar.

Study 2

One aim of this second study is to provide further evidence on the reliability by assessing the test-retest reliability of the two scales developed in Study 1 (i.e., the combination of the SD3 and the ASP in its short —D20— and full version —S3 + ASP—).

Materials and Methods

Participants and procedure

This second study was conducted with a total of 76 participants (26.3% women), mean age of 20.07 (*SD* = 3.83), ranging from 18 to 38. All of them were undergraduate university students. As in Study 1, participants in this second study were also recruited by convenience sampling with psychology students. The first data collection was conducted during the month of February 2023, and the second was during the month of May 2023. For the data collection at both time points, participants were asked to fill out the survey alone at home. While participants did not receive direct compensation for their involvement in the study, their participation was recorded through a survey

question that requested their individual university ID (which was detached from their answers), and their participation was considered when determining the participation mark for the subject. This study was also evaluated by the ethical committee of the University (DPS.JPR.02.20) and to participate in the study the participants had to give their informed consent.

Table 5. Bivariate correlations between the study variables and the combination of the Short Dark Triad (SD3) and the Assessment of Sadistic Personality (ASP) in its short (Dirty Twenty —D20) and full (SD3 + ASP) version

Variables	D20 / SD3 + ASP				
	α / ω	N	M	P	S
DTDD					
Narcissism	.82/.83	.44**/.48**	.41**/.40**	.33**/.31**	.33**/.33**
Machiavellianism	.78/.79	.30**/.30**	.54**/.52**	.51**/.48**	.48**/.48**
Psychopathy	.62/.64	.26**/.25**	.38**/.36**	.47**/.47**	.38**/.40**
SISS					
Sadism	.70/.84	.20**/.21**	.38**/.35**	.48**/.50**	.72**/.72**
HEXACO-60					
Honesty	.68/.69	-.29**/-.31**	-.43**/-.40**	-.38**/-.37**	-.30**/-.31**
Emotionality	.70/.70	-.13**/-.16**	-.08**/-.07*	-.15**/-.23**	-.13**/-.15**
Extraversion	.77/.78	.27**/.38**	-.14**/-.14**	-.13**/-.10**	-.16**/-.13**
Agreeableness	.69/.69	-.04/-.06*	-.24**/-.21**	-.33**/-.31**	-.25**/-.24**
Conscientiousness	.74/.74	-.06*/-.05	-.18**/-.14**	-.22**/-.26**	-.18**/-.19**
Openness	.73/.73	.10**/.09**	-.04/-.03	-.07*/-.08**	.01/-.01
SDQ					
Emotional symptoms	.79/.80	-.09**/-.18**	.14**/.15**	.10**/.06	.12**/.08**
Conduct problems	.32/.42	.21**/.24**	.34**/.31**	.42**/.44**	.29**/.32**
Hyperactivity	.58/.59	.11**/.09**	.19**/.16**	.19**/.24**	.15**/.16**
Relationship problems	.50/.51	-.07*/-.12**	.21**/.23**	.21**/.19**	.21**/.19**
Prosocial behavior	.64/.66	.02/.01	-.22**/-.20**	-.27**/-.27**	-.21**/-.24**

Note. N = Narcissism; M = Machiavellianism; P = Psychopathy; S = Sadism; DTDD = Dark Triad Dirty Dozen; SISS = Short Sadistic Impulse Scale; HEXACO-60 = HEXACO-60 Personality Inventory-Revised; SDQ = Strengths and Difficulties Questionnaire; α = Cronbach's alpha; ω = McDonald's omega; **$p < .01$; *$p < .05$.

Instruments

Short Dark Triad (SD3) and Assessment of Sadistic Personality (ASP)

For this second study, the SD3 (Jones & Paulhus, 2014), which assess the three traits of the Dark Triad (i.e., narcissism, Machiavellianism, and psychopathy), and the ASP (ASP; Plouffe et al., 2017), which assess the everyday sadism, were administered again in its Spanish version (Pineda et al., 2020, 2021). The combination of these scales, in turn, would allow us to obtain the 20 items of the D20, considering the results obtained in Study 1 (see Study 1 for a more detailed description of both scales).

Data analysis

The Intra-Class Correlation (ICC) was analyzed using the statistical program SPSS (version 25), which allows obtaining a statistical value on the test-retest reliability of the two versions of the instrument to measure the Dark Tetrad (the 20-item D20 and the 36-item SD3 + ASP), and which allows an accurate execution with only 30 participants. Thus, a two-way mixed-effects model was obtained in which the effects of the persons are random, and the effects of the measures are fixed, and which reported the ICC value with a 95% confidence interval. ICC values below .50 would indicate poor reliability, values between .50 and .75 would indicate moderate reliability, values between .75 and .90 would indicate good reliability, and values greater than .90 would indicate excellent reliability (but considering the confidence intervals) (Koo & Li, 2016).

Results

Test-retest reliability of the D20 and SD3 + ASP: Intra-Class Correlation (ICC)

The intra-class correlational analysis showed values between .82 and .89 for the D20 subscales, and values between .85 and .90 for the SD3 + ASP subscales, in both cases with a 95% confidence interval (see Table 6). Following the indications of Koo and Li (2016), in the case of D20, considering the confidence intervals all the scales presented good to excellent reliabilities, except for the narcissism subscale with moderate to good reliability. Similar results were found for the combination of the SD3 and the ASP. However, in this case, the narcissism scale was also achieving excellent reliability in the upper bound of the interval confidence.

Table 6. Test-retest reliability of the combination of the Short Dark Triad (SD3) and the Assessment of Sadistic Personality (ASP) in its short (Dirty Twenty —D20) and full (SD3 + ASP) version: Intra-Class Correlation (ICC)

Single measures	95% confidence interval			F test with true value 0		
	Intra-Class Correlation	Lower bound	Upper bound	Value	df1	df2
D20						
Narcissism	.82	.72	.89	5.96***	75	75
Machiavellianism	.89	.82	.93	8.81***	75	75
Psychopathy	.84	.75	.90	6.39***	75	75
Sadism	.84	.75	.90	6.20***	75	75
SD3 + ASP					75	75
Narcissism	.85	.76	.90	6.67***	75	75
Machiavellianism	.90	.84	.94	10.34***	75	75
Psychopathy	.88	.82	.92	8.91***	75	75
Sadism	.85	.76	.91	6.68***	75	75

Note. ***$p < .001$

Study 3

As mentioned in the main introduction, there is no single scale to measure Dark Tetrad traits since after the first one proposed by Plouffe et al. (2017), from the combination of the SD3 and the ASP, the original authors of the Dark Triad construct together with other collaborators developed a new measure for assessing the dark tetrad (i.e., the 28-items SD4; Paulhus et al., 2021). This scale although its validation is not published in Spanish, it has been translated into this language by Ortet-Walker et al. (2021, 2022). The objective of this study is to further evaluate the validity of the constructs measured in this new scale, i.e., the D20, by showing its correlations with the 28-item SD4 (Paulhus et al., 2021). We expect that this validity assessment serves two different purposes: (1) to offer more data confirming the construct validity of the D20 since we predict large direct correlations coefficients between this scale and the 28-item SD4 considering that they are measuring the same constructs derived from similar initial pools of items; and based on these expected similarities between scales (2) to give some evidence about the usefulness of these two scales for cross-cultural comparisons.

Materials and Methods

Participants and procedure

The sample of this third study consisted of a total of 194 Spanish participants, with a mean age of 27.57 (*SD* = 12.66) and with ages ranging from 18 to 71; 70.60% were women (*N* = 137). Most of them were single (*n* = 78; 40.20%) or had a partner, but without legal recognition (*n* = 70; 36.10%). Half of the sample had at least a high school diploma (*n* = 99; 51%) and at the time of answering the survey most of them were students (*n* = 117; 60.30%).

Participants were also recruit by convenience sampling and, likewise, the survey was disseminated through social networks. The data collection was conducted during the month of June 2023 and participants did not receive any compensation for their participation. This study was also evaluated by the ethical committee the University (TFG.GPS.DPS.VGG.230310) and to participate in the study the participants had to give their informed consent.

Instruments

Dirty Twenty (D20)

The D20 validated in Study 1 was administered (see Study 1 for more information). For the present sample the following reliability indices were obtained: an α = .63 and ω = .67 for narcissism,

an α = .77 and ω = .77 for Machiavellianism, an α = .75 and ω = .76 for psychopathy, and an α = .89 and ω = .90 for sadism.

Short Dark Tetrad (SD4)

The SD4 (Paulhus et al.; 2021) is a 28-item scale that assess the four Dark Tetrad traits, i.e., narcissism, Machiavellianism, psychopathy, and sadism. It is composed by 7 items per factor, which are answered on a 5-point Likert-type scale (from 0 = *strongly disagree* to 4 = *strongly agree*). This scale was also administered in its Spanish version which, although not validated, has been adapted to this language and has presented adequate psychometric properties, with an α = .73 for narcissism, an α = .75 for Machiavellianism, an α = .65 for psychopathy, and an α = .78 for sadism (Ortet-Walker et al., 2021, 2022). For the present sample the following reliability indices were obtained: an α = .75 and ω = .76 for narcissism, an α = .65 and ω = .66 for Machiavellianism, an α = .76 and ω = .77 for psychopathy, and an α = .79 and ω = .79 for sadism.

Data analysis

On the one hand, sample descriptive data and reliability indices (i.e., α and ω) were obtained using SPSS (version 25) and Jamovi (version 2.2.5) statistical software. On the other hand, Pearson's bivariate correlations of both scales were also analyzed using the SPSS statistical program (version 25) to analyze the convergent validity of the scales.

Results

***Bivariate Correlations of D20 and the SD4: convergent validity of the* D20**

Table 7 presents the bivariate correlations obtained between the version of the Dark Tetrad scale validated in study 1 (i.e., 20-item D20) and the 28-item SD4 version by Paulhus et al (2021). The values showed significant and positive correlations with all traits ($p < .01$ and $p < .05$) of the SD4, with small to moderate magnitudes of association.

Table 7. Bivariate correlations between the Dirty Twenty (D20) and the Short Dark Tetrad (SD4)

D20	SD4			
	Narcissism	Machiavellianism	Psychopathy	Sadism
Narcissism	.66**	.22**	.30**	.32**
Machiavellianism	.25**	.61**	.29**	.60**
Psychopathy	.30**	.34**	.54**	.59**
Sadism	.17*	.33**	.40**	.57**

Note. **$p < .01$; *$p < .05$.

General Discussion

The main aim of the present research was to develop a brief, but valid and reliable, instrument to assess the dark tetrad in the Spanish context, the Dirty Twenty (D20). With five items for assessing each trait, the confirmatory factor analyses performed showed a good fit of its structure, like the indices found by Paulhus et al. (2021), in the development of their 28-item SD4. Notwithstanding, regarding model comparison, fitting indices are not the only issue to consider, since a balance between them and the parsimony of the model must be achieved (Vandekerckhove et al., 2015). Thus, justifying the reduction of the items performed on the D20.

The 36-item scales based on the combination of the ASP (Plouffe et al., 2017) and the SD3 (Jones & Paulhus, 2014), showed also good fit indices. Although it presents good structure, some of its items do not properly work (i.e., the reversed ones). However, the use of the 36 items scale (even though knowing that some items were not helping with the reliability values of the scale) was useful because it allowed cross-cultural comparisons (Pineda et al., 2020, 2021). Therefore, conducting researchers to relocate the efforts in developing shorter versions of instruments to measure the same construct of personality without using these items (e.g., Meng et al., 2022).

Attending to the reliability of the 20 items measure, our results show acceptable to good internal consistency values of the scale, being Machiavellianism and sadism the traits obtaining the higher reliability values and narcissism the lowest. These results were also found in the longer 36-items version (SD3 + ASP) and in the Spanish SD4 28-item version (Ortet-Walker et al., 2021, 2022). In terms of test-retest reliability, the subscales of the D20 demonstrated consistently strong indices, indicating a good level of reliability. This suggests that the D20 can be considered a reliable measure for assessing the constructs it intends to capture.

Regarding gender differences, as expected, and shown previously by extensive research, men showed higher scores in these traits (e.g., Paulhus et al., 2021; Pineda et al., 2020). However, the structure invariance across genders of the measures used to assess these traits has been less studied (e.g., Meng et al., 2022). Our results confirm that these differences between genders are not better explained by different factor structures of the D20 for men or women.

Concerning the validity of the scale, the different Dark Tetrad traits measured with the D20 show proper criterion validity by the expected associations with other related constructs. Divergent relationships appeared with scales that aim to measure prosocial behavior or other personality traits which are conceptually opposite to the Dark Tetrad traits, and convergent relationships were found with those other measures designed to assess the same constructs and other problematic behaviors (e.g., Muris et al., 2017; Naor-Ziv et al., 2022; Papageorgiou et al., 2020; Pineda et al., 2020, 2021; Schreyer et al., 2021).

In regard to the construct validity, when comparing the D20 with other measures used to assess the Dark Tetrad of personality, the SD3 + ASP and SD4, as expected, large correlations appear (Cohen, 1988). When comparing the D20 with its antecedent, the widely used combination of the SD3 and ASP, we found high correlations, implying that the same underlying constructs are being measured, similar findings to the ones reported in other item reductions of measures to assess these constructs (Meng et al., 2022). Likewise large correlations, although not as large as the previous mentioned, were found with the SD4 developed by Paulhus et al. (2021). In this case, the differences are likely to arise from the different pools items used in the development of the scales, that although conceptualizing the same constructs some differences may arise due to the reduced number of items in both scales (Niemi et al., 1986). Although employing comparable construct definitions for the Dark Triad traits and striving to maximize the distinctiveness of each trait in the measure, the everyday sadism trait of the SD4 displayed high correlations with the D20 scales of Machiavellianism and psychopathy. These correlations might be explained by the different definitions and item pools used to develop these scales, since the SD4 relies on the definition offered by Buckels et al., (2013) when developing the Comprehensive Assessment of Sadistic Tendencies (CAST), our items are derived from the ASP (Plouffe et al., 2017).

Limitations

It is worth mentioning that this study does not come without limitations which mainly refer to the sample. First, even though a large sample of participants were collected for the first study, the second study obtained a smaller participation. Therefore, although the ICC analysis allows an accurate performance with only 30 participants (Koo & Li, 2016), a small sample was generated (N = 75) to assess the correlations between the D20 and the SD4. Furthermore, as a second limitation that concerns the participants, most of them in both studies were women, compromising the generalization of the results. Therefore, we suggest that further studies aim to address these issues and endorse these findings.

A final limitation of this study is the low reliability obtained for narcissism in both the short (D20) and long version of the SD3 + ASP combination. However, previous studies in Spanish have also reported low reliability (Fernández del Rio et al., 2019; Pineda et al., 2021, 2023), so it would be interesting to analyze the reason for this finding, considering the possibility that it is because people with narcissistic traits show greater social desirability in self-reports.

Conclusion

Concluding, we designed this research with the objective of offering a short and concise measure to assess the Dark Tetrad of personality. Meeting this aim, we offer a valid and reliable measure, which following the principle of parsimony, will allow practitioners and researchers to evaluate these traits in situations in which the use of little time for completing questionnaires is required.

Declaration of interest statement

The authors report there are no competing interests to declare.

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Appendix 6

Study 6

Objective and indirect assessment instruments of the Dark Triad and Dark Tetrad 20 years later: a systematic review

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Objective and indirect assessment instruments of the Dark Triad and Dark Tetrad 20 years later: a systematic review

Abstract

Self-report is considered the "gold standard" technique for personality assessment despite its measurement biases. The purpose of this study was to summarize the measures that have been used to indirectly assess Dark Triad and Dark Tetrad traits by collecting objective tools used to assess characteristics related to these traits and defined in these tools. A systematic review was conducted in PubMed, PsycINFO, Web of Science, and Scopus databases, and 189 studies were included, which reported 268 tools. To obtain a joint view of the results, a classification into 6 categories was proposed following Ortner's and Proyer's classification and adding two more categories after reviewing the literature. The best assessment will always combine different measurement methods. Therefore, researchers are encouraged to continue using in their studies the objective tools collected in this review to assess these traits, to continue designing new ones, and to provide more validity results.

Keywords: personality; objective assessment; indirect assessment; objective measures; self-report.

Introduction

The Dark Triad, proposed by Paulhus and Williams in 2002, represents a set of three malevolent personality traits, namely Machiavellianism, subclinical narcissism, and subclinical psychopathy. The central and common core of all three traits is callousness (Jones & Paulhus, 2011, 2014).

More specifically, people with narcissistic traits are characterized mainly by feelings of grandiosity. They present egocentric self-admiration of their own qualities, which makes them feel superior people who constantly need to reinforce their ego (Jones & Paulhus, 2014; Paulhus & Williams, 2002; Raskin & Hall, 1979). In turn, the main characteristics of a person with Machiavellian traits are callous affect, manipulation, and strategic orientation. These people seem to plan ahead, which makes them strategic people who are primarily focused on their self-interest and personal gain (Christie & Geis, 1970; Jones & Paulhus, 2009, 2014; Paulhus & Williams, 2002; Pineda et al., 2020). Finally, people with psychopathic traits are characterized mainly by low empathy and lack of remorse for their actions, impulsivity, sensation-seeking, and uninhibited behavior. These people present antisocial behavior (Hare, 1970; Jones & Paulhus, 2014; Paulhus & Williams, 2002; Pineda et al., 2020).

Subsequently, everyday sadism was introduced as a fourth malevolent trait, forming the well-known Dark Tetrad. Associations were obtained with the other three traits and it was concluded that the four traits overlapped, although they were distinct (Chabrol et al., 2009). People with these traits are mainly characterized by deriving pleasure or a feeling of enjoyment from observing or causing harm to others (Chabrol et al., 2009; O'Meara et al., 2011).

The interest in the study of these malevolent personality traits has increased exponentially in the last years, given their relationship with a wide variety of antisocial and objectionable behaviors, such as verbal, physical or sexual aggressions, bullying and cyberbullying, sextortion, cyberviolence, Intimate Partner Violence, and general delinquency, among others (e.g., Alsheikh Ali, 2020; Hayes et al., 2021; Kanemasa et al., 2022; Moor & Anderson, 2019; Pineda et al., 2022; Pineda et al., 2023; Thomas & Egan, 2022).

As a consequence of this growing interest, most of the self-report instruments designed to measure both Dark Triad traits and Dark Tetrad traits, such as the Short Dark Triad, the Dirty Dozen, the Short Sadistic Impulsive Scale, the Comprehensive Assessment of Sadistic Tendencies, the Assessment of Sadistic Personality, or the Short Dark Tetrad, and Hateful Eight (Buckels & Paulhus, 2013; Jonason & Webster, 2010; Jones & Paulhus, 2014; O'Meara et al., 2011; Paulhus et al., 2020; Plouffe et al., 2017; Webster & Wongsomboon, 2020) have been validated in samples of different nationalities, such as Spanish, Canadian, French, Turkish, Portuguese, German, Chinese, Polish or Serbian, among others (e.g., Czarna et al., 2016; Dinić et al., 2018; Macedo et al., 2017; Meng et al., 2022; Özsoy et al., 2017; Pineda et al., 2020, 2021; Savard et al., 2017; Wehner et al., 2021).

Although both the original scales and the adaptations in different samples present good psychometric properties (Buckels & Paulhus, 2013; Czarna et al., 2016; Dinić et al., 2018; Jonason & Webster, 2010; Jones & Paulhus, 2014; Macedo et al., 2017; Meng et al., 2022; O'Meara et al., 2011; Özsoy et al., 2017; Paulhus et al., 2020; Pineda et al., 2020, 2021; Plouffe et al., 2017; Savard et al., 2017; Webster & Wongsomboon, 2020; Wehner et al., 2021), it is well known that self-reports present measurement biases (e.g., Abernethy, 2015; Althubaiti, 2016; McDonald, 2008), despite being the most common method of data collection in psychology (McDonald, 2008; Paulhus & Vazire, 2007).

For years, self-report has been considered the "gold standard" technique for personality assessment, assuming that individuals can report their self-observations of their behavioral tendencies in a questionnaire, providing an indirect assessment of their personality traits through their self-perceptions (Kyllonen & Kell, 2018; McDonald, 2008; Ortner & Proyer, 2015; Paulhus & Vazire, 2007). Notwithstanding, under this assumption, self-reports "capture some of the shared reality of people's actual behavior, as correlations between self-reports of personality traits and observers' reports of personality traits range from $r = .29$ to $r = .41$". Therefore, self-report assessment is not error-free (Connelly & Ones, 2010; Kyllonen & Kell, 2018, p. 8).

Self-reports present several advantages to other techniques but they are not perfect, and they also have some disadvantages (Abernethy, 2015; Althubaiti, 2016). Some of the advantages

mentioned by McDonald (2008) are the ease with which people can transmit a large amount of information about themselves (not accessible to others), with their motivation to talk about themselves standing out. Other advantages are that self-reports are quick to administer and easy to interpret, and they are inexpensive. However, some of the disadvantages include difficulty in accurately measuring the desired construct (e.g., when designing the structure of the items), problems with recall of past events, and response biases such as response tendencies (acquiescence and extreme responses), social desirability, or distortion in the way people perceive themselves (Abernethy, 2015; Althubaiti, 2016; McDonald, 2008).

Given the shortcomings in self-report methodology, scientists have endeavored to design new, more objective measurement methods that address the limitations of self-reports: the well-known Objective Personality Tests (OPTs; Cattell, 1946) (Hernández-López et al., 1999; Lozano-Bleda et al., 2010; Rubio et al., 2004; Santacreu & Hernández, 2018). These are considered a procedure that provides scores based on responses to stimuli without the person knowing the correct or incorrect response and without being able to modify their responses in a specific direction (Hundleby, 1973). Cattell and Warburton (1967) differentiated between three ways of assessing personality: questionnaires (Q data), biographical data (L data), and tests (T data), the latter coming from objective tests.

OPTs require the person to perform in specific situational tests or tasks, allowing their personality assessment based on their behavior in these tests. This assumes that if people show consistent behaviors in different contexts in which they may act differently according to their personality (e.g., in conditions with different degrees of risk or collaboration), personality can be assessed through the variables defined in these contexts (e.g., assessing personality through a risk-taking task) (Furr, 2009; Kubinger, 2009; Hernández-López et al., 1999; Santacreu, 2009; Santacreu & Hernández, 2018).

Summarizing, this approach is based on the idea that traits are expressed through behavior, implying that personality can be measured by assessing personality-related characteristics from observable behavior in tasks or standardized situations (Cattell & Warburton, 1967; McDonald, 2008).

OPTs form a very heterogeneous group of tests and, therefore, attempts have been made to make groupings to classify them. However, there does not seem to be much consensus (e.g., Furr, 2009; Olea et al., 2010; Ortner & Proyer, 2015, chapter 9). Ortner and Proyer (2015, chapter 9) propose in their study a classification into three groups: OPTs masked as achievement tasks, OPTs that aim to represent real-life simulations, and Questionnaire-type OPTs that ask for evaluations or decisions.

The first group refers to tests that require individuals to "solve an achievement task as accurately and/or quickly as possible without knowing what is being measured or how the instrument is scored. The task is not embedded in a simulated or imagined/suggested real-world context or real-life situation" (Ortner & Proyer, 2015, p. 7). The second group refers to tests in which individuals "must solve a less or more complex task embedded in a real-life situation or setting. Tests of this type have not been developed or presented as pure achievement tasks, although participants work toward such a goal" (Ortner & Proyer, 2015, p. 9). The third group refers to tests in which individuals "are instructed to answer items that are similar to questionnaire items or to make other forms of evaluative decisions" (Ortner & Proyer, 2015, p. 11).

Other authors included in their classifications the well-known peer-report, which consists of collecting ratings of the target's personality from others, such as family members or friends. They are considered another valid and objective way of assessing personality (Abernethy, 2015; Connelly & Ones, 2010; Furr, 2009; McDonald, 2008). Similarly, biomedical data or psychophysiological data were also included as another type of objective measure (Cattell & Warburton, 1967; Hundleby, 1973).

All information considered, although there is no clear classification for OPTs to date, a wide variety of tools have been designed that could be categorized within the above classifications. These measures have been used to assess more objectively constructs related to the Dark Triad and Dark Tetrad traits and have provided data affirming the association between these variables. This shows the usefulness of these measures to assess these malevolent traits more indirectly. For example,

within the OPTs masked as achievement tasks, some tests measure intelligence or cheating behavior (Jackson, 2018; Nicholls et al., 2020). Within the OPTs that simulate real-life situations, some tests measure risky or socially valuable decision-making (Malesza & Kalinowski, 2021b; Sekścińska & Rudzinska-Wojciechowska, 2020). Finally, within the Questionnaire-type OPTs that request evaluations or decisions, some tests measure utilitarian or antisocial decision-making (Dinić et al., 2021; Sagioglou & Greitemeyer, 2020). Similarly, several studies have used peer assessment (Lämmle et al., 2021; Malesza & Kaczmarek, 2020) or biomedical data (Dane et al., 2018; Prichard, 2019) for the same purpose.

Purpose of the Present Study

Given the advances in the design of more objective measures and the promising results of their psychometric properties (they seem less susceptible to faking or other response distortions) (Ortner & Proyer, 2015; Ortner & Schmitt, 2014; Proyer & Häusler, 2007), the authors highlight the importance of combining self-reports (questionnaires) with more objective measures for measuring personality (Kyllonen & Kell, 2018; McDonald, 2008; Ortner & Proyer, 2015).

All this becomes more relevant when assessing undesirable personality traits because self-report biases are more likely when assessing undesirable traits than when assessing desirable traits (distortion and manipulation of information are more likely in the respondent's answers), making forensic assessment more difficult than clinical assessment (Echeburúa et al., 2011; Spaans et al., 2017).

Consequently, to provide researchers with a range of all the alternatives to the use of questionnaires, this study aimed to summarize the instruments that have been used to assess the traits of the Dark Triad and the Dark Tetrad more indirectly (i.e., different from self-report assessment, as explained above). That is, objective measures used to assess characteristics related to these dark traits were collected (Cattell & Warburton, 1967; Furr, 2009; Kubinger, 2009; Hernández-López et al., 1999; McDonald, 2008; Santacreu, 2009; Santacreu & Hernández, 2018). For this purpose, a systematic review of the existing literature was carried out.

Method

Search Strategy and Study Selection

The systematic search was carried out during April 2021, in the electronic databases of PubMed, PsycINFO, Web of Science, and Scopus. For this purpose, the following search terms were established according to the needs of the study: Dark Triad, Dark Tetrad, Dark traits, Narcissism, Machiavellianism, and Psychopathy. As a result, the following search string was used: ("Dark Triad" OR "Dark Tetrad" OR "Dark traits") OR ("Narcissism" AND "Machiavellianism" AND "Psychopathy").

Inclusion and Exclusion Criteria

Given that this systematic review aimed to identify indirect instruments used to assess constructs related to the traits of the Dark Triad or the Dark Tetrad as initially conceived (Paulhus & Williams, 2002), only studies that assessed at least three of the Dark Triad traits (i.e., Machiavellianism, narcissism, and psychopathy) were included. Therefore, research that assessed only one or two traits was excluded from this study. Studies that only presented the results of some of the traits (perhaps the significant ones) but that administered a self-report to measure all the Dark Triad or Dark Tetrad traits were included in the review because, again, the set of dark traits would have been measured as they were initially conceived. Similarly, studies that did not report any data on the relationship (e.g., by type of analysis) between the dark traits and the other constructs measured but that did measure the Dark Triad or Dark Tetrad were also included for the indirect instrument employed.

Likewise, studies that divided the traits into sub-factors (e.g., primary psychopathy and secondary psychopathy) were also excluded because the traits would not be presented as initially conceived (Paulhus & Williams, 2002). However, if a study presented vulnerable narcissism and grandiose narcissism (rather than narcissism as a single factor), the latter was considered valid because, according to Jones and Paulhus (2014), grandiose narcissism corresponds to Dark Triad narcissism.

With this in mind, the following inclusion criteria were established to consider whether or not articles were eligible: (1) unique studies (i.e., that were not duplicates); (2) studies related to the

topic of interest (i.e., Dark Triad or Dark Tetrad traits); (3) papers written in English or Spanish; (4) any type of paper was valid, as long as it provided the complete study to read; (5) primary research (i.e., no narrative, systematic, or meta-analytic reviews, or umbrella reviews); (6) studies that measured at least three of the four traits (i.e., Machiavellianism, narcissism, and psychopathy—the Dark Triad); (7) studies that did not divide all or some of the factors into subfactors (e.g., they offered the psychopathy trait but not its subfactors, i.e., primary psychopathy and secondary psychopathy); (8) studies that divided the Dark Triad and Dark Tetrad into their traits, without reporting a single dark score (e.g., only a total Dark Triad); (9) studies that administered a self-report questionnaire/s to assess the Dark Triad or Dark Tetrad; (10) studies that used an objective measure to assess trait-related characteristics of the Dark Triad or Dark Tetrad. The exclusion criteria were the opposite of the inclusion criteria.

In summary, for this systematic review, we sought studies that, firstly, have measured Dark Triad traits or Dark Tetrad traits as they are conceptually known (Paulhus & Williams, 2002) using self-reports and, secondly, have also administered objective measures to assess any characteristic that may be related to Dark Triad or Dark Tetrad traits (e.g., risk-taking, impulsivity, moral judgment, etc.) (Cattell & Warburton, 1967; Furr, 2009; Kubinger, 2009; Hernández-López et al., 1999; McDonald, 2008; Santacreu, 2009; Santacreu & Hernández, 2018). The search included all studies published since 2002, the year of publication of the Dark Triad (Paulhus & Williams, 2002).

Data Extraction

Firstly, all the studies that appeared in the different databases after the search were downloaded onto a reference manager (i.e., software Zotero; https://www.zotero.org/). Then, through the reference manager, duplicates were eliminated, and the remaining articles were transferred to an Excel sheet.

Secondly, two screening phases were carried out. In the first, the titles and abstracts of all articles were carefully read to eliminate all those that did not meet the inclusion criteria. In case of doubt, as the entire article was not carefully read at this stage, the study was considered to meet the criteria. At this stage, two independent reviewers screened 10% of the studies (the same studies) and then, after determining concordance between the two reviewers, each reviewer screened 50% of the remaining articles. As a result, 1337 studies were selected. Then, in the second screening phase, all the articles that had been selected in the previous screening phase were carefully read to ensure that the studies that definitely met the inclusion criteria were included. Again, the two reviewers first screened the same studies (10%) and, after checking for concordance, each of them screened 50% of the remaining studies. As a result of this screening, all the studies considered appropriate for inclusion in this systematic review were obtained ($n = 189$). The PRISMA flow (Figure 1) represents all the steps described.
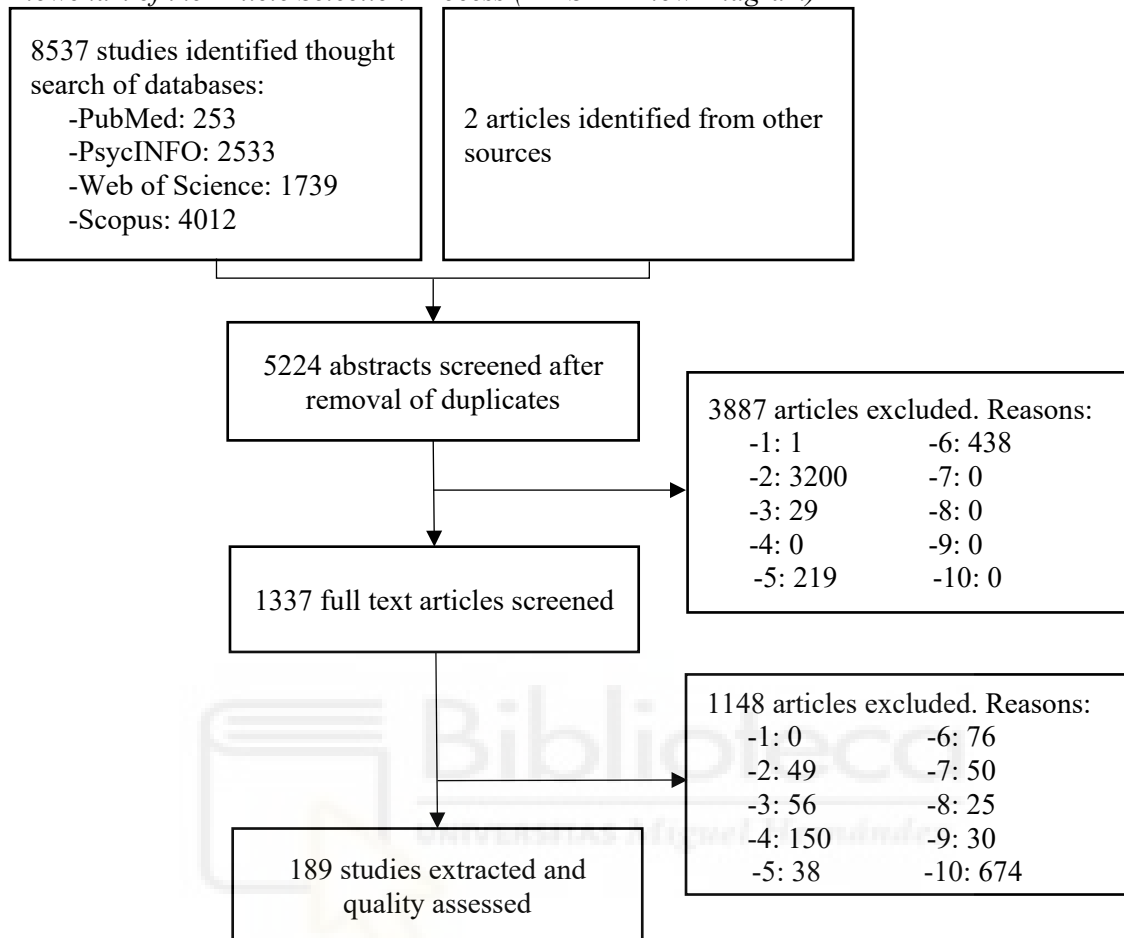
Third, the variables of interest were coded in an Excel spreadsheet like Table 1 (supplemental material). For this purpose, a Coding Manual was prepared beforehand, which specified and explained each of the variables in detail, to avoid confusion when extracting the data from the studies. The target variables in each study were the following: authors and year of the study, information on the indirect instruments used (i.e., name and type of instrument, variables measured, and reliability indices), outcome found in the studies (i.e., the statistical value indicating the relationship of the variables measured with the objective instruments and the traits of the Dark Triad or Dark Tetrad), and the conclusions (i.e., the Dark Triad or Dark Tetrad traits to which the target variables measured with the objective instruments were related).

Some points were taken into consideration when coding the variables: (1) some papers found in the searches in April 2021 appear at the end of the publication year 2022, as this is their updated data. Hence, some studies cited with the year 2022 were included in the review, even though the search date was April 2021; (2) Regarding the outcome variable, it was not considered necessary to indicate the direction of the reported value (i.e., whether the relationship was positive or negative) as it did not match the interests of this systematic review. Thus, only the value of the relationship was indicated; (3) Some of the studies offered in the same document their results divided among several samples (e.g., among participants of different nationalities, or between women and men). In these cases, the results were taken together and not split by sample, as this was not an objective of

this systematic review. Readers are encouraged to consult the different studies included in this review if they wish to explore this further.

Figure 1

Flowchart of the Article Selection Process (PRISMA Flow Diagram)


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┌─────────────────────────────────┐   ┌─────────────────────────────────┐
│ 8537 studies identified thought │   │                                 │
│ search of databases:            │   │ 2 articles identified from other│
│   -PubMed: 253                  │   │ sources                         │
│   -PsycINFO: 2533               │   │                                 │
│   -Web of Science: 1739         │   │                                 │
│   -Scopus: 4012                 │   │                                 │
└─────────────────────────────────┘   └─────────────────────────────────┘

          ┌──────────────────────────────┐   ┌────────────────────────────────┐
          │ 5224 abstracts screened after│   │ 3887 articles excluded. Reasons:│
          │ removal of duplicates        │──▶│   -1: 1          -6: 438        │
          └──────────────────────────────┘   │   -2: 3200       -7: 0         │
                                              │   -3: 29         -8: 0         │
                                              │   -4: 0          -9: 0         │
          ┌──────────────────────────────┐   │   -5: 219        -10: 0        │
          │ 1337 full text articles      │   └────────────────────────────────┘
          │ screened                     │
          └──────────────────────────────┘   ┌────────────────────────────────┐
                                              │ 1148 articles excluded. Reasons:│
                                              │   -1: 0          -6: 76        │
                                              │   -2: 49         -7: 50        │
          ┌──────────────────────────────┐   │   -3: 56         -8: 25        │
          │ 189 studies extracted and    │──▶│   -4: 150        -9: 30        │
          │ quality assessed             │   │   -5: 38         -10: 674      │
          └──────────────────────────────┘   └────────────────────────────────┘
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Note. Exclusion criteria: 1 = Duplicate; 2 = Unrelated to the topic; 3 = Different language; 4 = Complete document not accessible; 5 = Not primary investigation; 6 = Do not measure at least three of the four traits; 7 = Divides all or some of the factors into subfactors without giving a total measure; 8 = Does not divide the Dark Triad or the Dark Tetrad; 9 = No questionnaire is administered to assess the Dark Triad or Dark Tetrad; 10 = Does not use an objective measure to assess trait-related characteristics of the Dark Triad or Dark Tetrad.

To indicate the type of indirect instrument, the Ortner and Proyer (2015, chapter 9) classification was followed, plus the two other ways of indirectly assessing personality mentioned in the introduction (i.e., biomedical data or psychophysiological measures, or peer assessment) (Abernethy, 2015; Cattell & Warburton, 1967; Connelly & Ones, 2010; Furr, 2009; Hundleby, 1973; McDonald, 2008). The category of "other" was also added to classify any instrument that could be considered indirect by its characteristics but did not fit any of the other categories. Thus, each instrument could be classified into 6 categories: 1 = OPTs masked as achievement tasks, 2 = OPTs that aim to represent real-life simulations, 3 = Questionnaire-type OPTs that ask for evaluations or decisions, 4 = Objective measure in peer-report format, 5 = Objective measure in biomedical data format, 6 = Other. In the "other" category, how the variables were indirectly evaluated should be indicated in parentheses to provide more details.

One reviewer coded all variables of interest from all the studies that met the inclusion criteria (i.e., of the 189 studies) with the participation of trained undergraduate students as reviewers (see Acknowledgments) and, to ensure reliability in coding, three reviewers independently coded the variables from 19 studies (i.e., they coded 10% of the studies). The results extracted by the three reviewers were consistent in terms of author and year variables, measured variables and reliability

indices, outcomes and conclusions. However, in the coding of the indirect instrument categories, there were discrepancies in a few instruments. Hence, to obtain an inter-rater reliability value, a correlational analysis was performed, which indicated strong agreement between the three raters (r = .90, p < .001, between reviewer one and two; r = .91, p < .001, between reviewer one and three; r = .99, p < .001, between reviewer two and three). In these cases where there was no overlap, to make the final decision of which category to assign to the instruments, another independent examiner offered their expert opinion until a consensus was reached.

Quality Assessment

The methodological quality of the studies was assessed using the STROBE (Strengthening the Reporting of Observational Studies in Epidemiology; Elm et al., 2007; Vandenbroucke et al., 2007) statement, which includes a series of recommendations on what a study should contain when it is published. It is applicable to observational studies (cohort, case-control, and cross-sectional) and consists of a 22-item checklist (34, counting sub-elements) of the study title, abstract, introduction, method sections, results, and discussion.

For this review, all the studies analyzed (having met the inclusion criteria) were cross-sectional studies, so the specific checklist for this type of study was used as a reference. Specifically, this consisted of a total of 32 items scored with 0 when the study did not include the recommendation, with 0.5 when the study did include the recommendation, but in a very unspecific or incomplete manner, and with 1 when the study did include the recommendation in its entirety. In this way, a total quality score was calculated for each of the studies included in the review, such that a score equal to or greater than 85 indicated excellent quality, a score between 70 and 85 indicated good quality, a score between 50 and 70 indicated fair quality, and a score below 50 indicated poor quality (Limaye et al., 2018). "NA" could also be indicated when the recommendation was not applicable to the study in question and, therefore, was not evaluated.

To calculate the quality index for each study, first, the item scores for each study were summed and, second, the total score for each was multiplied by 100, and the result was divided by the maximum quality score that could be obtained (i.e., 32, although in some cases it could be lower if some items were assigned NP). Specifically, one reviewer checked all 32 items in the 189 studies that finally met the inclusion criteria, and another reviewer checked 10% of those studies (i.e., 19 studies out of 189). In this way, inter-observer reliability could be calculated using correlational analysis, which indicated strong agreement between the two correlation raters (r = .81, p < .001).

Transparency and openness

All data generated or analyzed during this study are included in this published article. To ensure the replicability of the study, following open science guidelines, the coding manual are openly available in the OSF repository at https://osf.io/ptsn7/?view_only=002a406948f04331a29ead9b03191e02.

The review was pre-registered in Anonymized (registration number: Anonymized), adhering to the disclosure requirements of the institutional registry. However, there were changes in the work plan after preregistration due to the stated objective: as many papers were registered, the variables to be coded were reviewed, finding that the study's objective could be achieved by coding a smaller number of variables.

Results

In the first search, a total of 8537 studies was obtained from the different databases, and 2 studies were also found from other sources. Of these, 3315 were excluded because they were duplicates, and 5035 because they did not meet the inclusion criteria in the two screening phases. As a result, 189 studies were included in the final review because they met the inclusion criteria (Figure 1).

Most of the studies that were excluded from the first screening were not related to the topic of interest (some articles that included the terms "dark," "triad," and "tetrad" appeared to meet the inclusion criteria but were not related to the Dark Triad or the Dark Tetrad) or they did not measure at least three of the four traits (forming at least the Dark Triad). Most were excluded from the second screening for not employing an objective measure of the characteristics related to the traits of interest. In this case, it was difficult to include terms in the search equation to filter out the studies of interest

due to the lack of homogeneity when mentioning objective measures, so initially, all studies had to be included regardless of whether or not they had employed an objective measure.

Assessment of the methodological quality of the selected studies showed that 4 studies were of excellent quality, 42 were of good quality, 127 were of fair quality, and 17 were of poor quality. What most of the studies lacked were more details on the study method, such as more details on the sampling strategy, the eligibility criteria and methods of selection of participants, and further specification of statistical methods, among other shortcomings.

Characteristics of the Included Studies and of the Indirect Instruments Used to Assess the Dark Triad and Dark Tetrad Traits

Table 1 shows the 189 studies included in the review and the variables of interest for this study. Most studies appear to have been published from 2016 onwards, with 2021 being the year with the highest number of publications of studies that have used an objective measure to assess constructs related to dark traits.

Firstly, overall, considering all the studies analyzed, 268 measures were used (counting that some were used more than once) that could indirectly assess Dark Triad and/or Dark Tetrad traits. Of these, 89.60% ($n = 241$) were used specifically to assess the Dark Triad and 10.07% ($n = 27$) to assess the Dark Tetrad. From the proposed classification of the tools into 6 categories, a total of 58 (21.56%) instruments were classified into the category of OPTs masked as achievement tasks, 62 (23.05%) into the category of OPTs that aim to represent real-life simulations, 106 (39.41%) into the category of Questionnaire-type OPTs that ask for evaluations or decisions, 9 (3.36%) into the category of objective measures in peer-report format, and 21 (7.81%) into the category of objective measures in biomedical data format. 12 (4.46%) were classified in the "other" category.

More specifically, and in terms of the variables assessed by the objective measures (which, therefore, indirectly assessed the dark traits), 121 different variables have been identified, distributed, as shown in Table 2.

Secondly, concerning the reliability of the measures, not all studies reported statistical indices that endorsed their adequate use. Of the studies that did (125 tools out of 268, i.e., 46.64%), most reported Cronbach's alpha values (although a few of them were lower than .60, most of them reached .70). However, as Cronbach's alpha is not a statistic that can be employed in all objective instruments (e.g., in tasks designed as games), the studies reported intra-class or intra-assay correlation values, among others.

Thirdly, regarding the results obtained in the studies, most of them offered correlation values, but data obtained with regression analysis (such as standardized and unstandardized beta) and data obtained with other estimators (such as two-variance coefficient or Gamma estimator) were also reported. However, some studies did not provide any data indicating the possible relationship between objectively measured variables and Dark Triad and Dark Tetrad traits ($n = 38$; 14.55%).

Of the studies that did report conclusions about the relationship ($n = 230$; 85.82%), on the one hand, 15.65% ($n = 36$) concluded that the relationship with any of the traits was nonsignificant, which could mean that it cannot be guaranteed that the instruments used in these studies could serve to indirectly measure dark traits with confidence. On the other hand, of the studies that did conclude that the relationship was significant (84.35%; $n = 194$), 4.78% ($n = 11$) obtained such relationships with all four Dark Tetrad traits (i.e., Machiavellianism, narcissism, psychopathy, and sadism), 38.70% ($n = 89$) with all three Dark Triad traits (i.e., Machiavellianism, narcissism, psychopathy), and 40.87% ($n = 94$) obtained relationships with one, two, or three of the traits (in the latter case, the three traits would not form the Dark Triad).

In turn, the three Dark Triad traits appear to have been significantly related to approximately the same number of variables measured with the objective measures (out of $n = 194$), as psychopathy was significantly related to 154 variables (79.38%), narcissism to 139 variables (71.65%), and Machiavellianism to 144 variables (74.23%).

Discussion

Given the biases in self-report personality assessment (Abernethy, 2015; Althubaiti, 2016; McDonald, 2008), especially in forensic assessment (Echeburúa et al., 2011; Spaans et al., 2017), and the authors' efforts to combine self-report personality assessment with the use of more objective measures (e.g., Kyllonen & Kell, 2018; McDonald, 2008; Ortner & Proyer, 2015), the aim of this

Table 1

Instruments for Indirect Assessment of Dark Triad and Dark Tetrad Traits, Objectively Measured Variables, and Relationships Between Them

Study	Indirect assessment			Results				Conclusion
	Instrument	Variable	Reliability	With P	With N	With M	With S	
Paulhus and Williams (2002)	1-Over Claiming Questionnaire (OCQ)	General Intelligence/ Convergent thinking	$\alpha = .84$	$r = .09$	$r = .09$	$r = .04$	NI	None
	1-OCQ	Over-claiming bias	$\alpha = .93$	$r = .09$	$r = .17$	$r = .08$	NI	N
	1-Wonderlic Personnel Test	General Intelligence/ Convergent thinking	NI	$r = .05$ and .13	$r = .05$ and .15	$r = .04$ and .20	NI	P, N, M
MacNeil (2008)	1- Multidimensional Aptitude Battery- Vocabulary Subtest (MAB-II)	Verbal ability	NI	NI	NI	NI	NI	NI
Jonason, Koenig et al. (2010)	2-Monetary dilemma	Risky decision making	NI	NI	NI	NI	NI	NI
Jonason, Li et al. (2010)	2-Scenarios and Amount allocation task	Decision making with social value (sharing)	NI	$r = .10 - .20$	$r = .10 - .20$	$r = .12 - .17$	NI	P, N, M
Williams et al. (2010)	2-Essays and Turn-It-In program	Cheating behavior	$\alpha = .57$	$r = .22$	$r = .12$	$r = .14$	NI	P, N, M
	1-UBC Word test	Verbal ability	$\alpha = .90$	$r = .14$	$r = .10$	$r = .01$	NI	None
Holtzman (2011)	4-Questionnaire *ad hoc*	Dark Triad/Tetrad	$\alpha = 0 - .84$	$r = .03$ and .13	$r = .19$ and .33	$r = .16$ and .22	NI	NI
Jonason, Valentine et al. (2011)	2-Budget-allocation task	Preferences in social relations	NI	$r = .02 - .22$	$r = .02 - .22$	$r = 0 - .13$	NI	P, N, M
Jonason et al. (2012)	2-Budget-allocation task	Preferences in social relations	NI	$r = .16 - .28$	$r = .22 - .31$	$r = .10 - .19$	NI	P, N, M
Jonason and Schmitt (2012)	2-Budget-allocation task	Preferences in social relations	NI	$r = .01 - .21$	$r = .07 - .41$	$r = .04 - .22$	NI	P, N, M
Rauthmann (2012)	2-The NASA game	Cooperative attitude	NI	NI	NI	NI	NI	NI
Sumner et al. (2012)	6(machine-learning)-LIWC software and WEKA toolkit	Networking language	NI	$r = 0 - .19$	$r = 0 - .16$	$r = 0 - .13$	NI	P, N, M
Ashton-James and Levordashka (2013)	6(observation)-Interviews and observations	Mimicry behavior	$r_{\text{intraclass}} = .41$ and .79	NI	$F = 0.75 - 6.86$	NI	NI	N
Buckels et al. (2013b)	2-Bug-crunching paradigm	Sadistic task choice	NI	NI	NI	NI	OR = 3.41	S
	1-White-noise paradigm	Harmful behavior	NI	$r_p = .22 - .62$	$r_p = .04 - .39$	$r_p = .04 - .12$	$r_p = .40 - .57$	P, N, S
Crysel et al. (2013)	2-Blackjack task	Risky decision making	NI	$r = .08$	$r = .13$	$r = .09$	NI	N

| Study | Indirect assessment | | | Results | | | | Conclusion |
	Instrument	Variable	Reliability	With P	With N	With M	With S	
	2-Balloon analogue risk task (BART)	Risky decision making	NI	$r = .08$	$r = .01$	$r = .10$	NI	None
	2-Discounting task	Risky decision making	NI	$r = .02$ and .10	$r = .12$ and .17	$r = .02$ and .05	NI	N
Holtzman and Strube (2013a)	4-Questionnaire *ad hoc*	Dark Triad/Tetrad	$\alpha = .04 - .78$	$r = .33$	$r = .48$	$r = .26$	NI	NI
Holtzman and Strube (2013b)	4-Questionnaire *ad hoc*	Dark Triad/Tetrad	$\alpha = .34 - .80$	$r_{intraclass} = .82$	$r_{intraclass} = .51$	$r_{intraclass} = .67$	NI	P, N, M
Jones (2013a)	3-Website advertisements and items	Racial, violent, and political attitudes	$\alpha = .92 - .97$	$r = .01 - .36$	$r = .01 - .17$	$r = .09 - .34$	NI	P, M
Jones (2013b)	2-Gambling task	Risky decision making	NI	$r = .01 - .30$	$r = .07 - .39$	$r = .02 - .19$	NI	P, N, M
Muris et al. (2013)	4-Dirty Dozen for Youths (DD-Y)	Dark Triad/Tetrad	$\alpha = .71 - .76$	$r_p = .23$	$r_p = .15$	$r_p = .32$	NI	P, M
Baughman et al. (2014b)	3-Scenarios and items	Cheating behavior	$\alpha = .64 - .82$	$r = .06 - .46$	$r = .07 - .28$	$r = .10 - .34$	NI	P, N, M
Black et al. (2014)	3-Video clips and items	Interpersonal assessment of vulnerability in others	NI	$r = .20 - .33$	$r = .21 - .28$	$r = .22 - .27$	NI	P, N, M
Djeriouat and Trémolière (2014)	3-Bartels' and Bartels et al.'s dilemmas	Utilitarian decision making	$\alpha = .87$	$r = .38$	$r = .18$	$r = .29$	NI	P, N, M
James et al. (2014)	3-Scenarios and items	Satisfaction for others' suffering	$\alpha = .74 - .82$	$r = .29 - .44$	$r = .10 - .21$	$r = .14 - .23$	NI	P, N, M
Jones (2014)	2-The ultimatum game	Risky decision making	NI	$r = .18 - .23$	$r = .02 - .18$	$r = .08 - .22$	NI	P, N, M
Jones and Olderbak (2014)	3-Scenarios and Tactics for Obtaining Sex Scale (TOSS)	Sexual tactics	$\alpha = .77 - .90$	$r = .02 - .58$	$r = .09 - .39$	$r = .03 - .30$	NI	P, N, M
Jones and Paulhus (2014)	4-Short Dark Triad (SD3)	Dark Triad/Tetrad	$\alpha = .62 - .86$	$r = .57$	$r = .34$	$r = .42$	NI	P, N, M
Lämmle et al. (2014)	2-White-Noise Paradigm	Self-harming behavior	NI	WRMR = 0.39	WRMR = 0.32	WRMR = 0.25	NI	N
Porter et al. (2014)	3-Scenarios and items	Satisfaction for others' suffering	$\alpha = .78 - .90$	$r = .21$ and .25	$r = .15$ and .17	$r = .09$ and .26	NI	P, M
	5-Facial Action Coding System (FACS)	Satisfaction for others' suffering	$r_{intraclass} = .78 - .88$	$r = .08$ and .27	$r = .04$ and .23	$r = .04$ and .22	NI	P, N, M

Study	Indirect assessment			Results				Conclusion
	Instrument	Variable	Reliability	With P	With N	With M	With S	
Rasmussen and Boon (2014)	3-Scenario and items	Emotion management	α = .87 and .90	r = .01 – .41	r = .14 – .22	r = .10 – .48	NI	P, N, M
D'Souza and de Lima (2015)	3-Assertions	Opportunistic decision making	NI	NI	NI	NI	NI	NI
Jonason et al. (2015)	3-Dating advertisement paradigm and items	Preferences in social relations	α = .69 – .91	r = .02 – .43	r = .01 – .37	r = .03 – .41	NI	P, N, M
Kapoor (2015)	1-Implicit Association Test (IAT)	Divergent thinking/Creativity	NI	B = 13.71 – 48.25	B = 2.64 – 29.20	B = 11.46 – 39.75	NI	P, M
Schneider et al. (2015)	3-Scenario and question	Social desirability	NI	Z-test = 2.32	Z-test = 1.07	NI	NI	P
Wright et al. (2015)	2-Deceptive interactive task (DeceIT)	Lie detection	NI	r = .06	r = .05 and .15	r = .03 and .10	NI	None
	2-DeceIT	Ability/Attitude to lie	NI	r = .05 and .08	r = .11 and .18	r = .09 and .10	NI	None
Zhang et al. (2015b)	1-Mayer–Salovey–Caruso Emotional Intelligence Test (MSCEIT)	Emotional intelligence	α = .91	r = .23	r = .16	r = .37	NI	P, N, M
Carre and Jones (2016)	2-BART	Risky decision making	NI	β = .04 – .28	β = 0 – .14	β = .01 – .24	NI	None
	2-IOWA Gambling Task (IGT)	Risky decision making	NI	NI	NI	NI	NI	None
Clark et al. (2016)	2-The Thieves' Game	Theft decision making	NI	NI	NI	β = .03	NI	None
Crossley et al. (2016)	2-Negotiation task	Ability to negotiate	NI	r = .03 – .14	r = .01 – .08	r = .04 – .21	NI	M
Czarna et al. (2016)	2-Triple Dominance Measure (SVO)	Decision making with social value (sharing)	NI	NI	NI	NI	NI	NI
	3-Bartels and Pizarro's dilemmas	Utilitarian decision making	α = .54	r = .25	r = .20	r = .16	NI	P
Dahmen-Wassenberg et al. (2016)	1-Creative explanations task (CE)	Divergent thinking/Creativity	NI	r = .10 and .13	r = .02 and .03	r = .10 and .16	NI	P, M
	1-Alternate Uses task (AUT)	Divergent thinking/Creativity	α = .91	r = .10 and .16	r = .06 and .08	r = .13 and .16	NI	P, M
	1-CE and AU	Divergent thinking/Creativity	NI	r = .15	r = .02	r = .16	NI	P, M

Study	Indirect assessment			Results				Conclusion
	Instrument	Variable	Reliability	With P	With N	With M	With S	
Galić (2016)	3-Conditional Reasoning Test for Aggression (CRT-A)	Conditional reasoning for aggression	$\alpha = .65$	$r = .02$	$r = .04$	$r = .11$	NI	None
Jankowski et al. (2016)	3-The Emotional Intelligence Test (TIE)	Emotional intelligence	$\alpha = .60 - .88$	NI	NI	NI	NI	NI
Jauk et al. (2016)	3-Speed dating and items	Preferences in social relations	NI	$\beta = 0.01 - 0.25$	$\beta = 0 - 0.36$	$\beta = 0 - 0.28$	NI	P, N, M
Kapoor and Khan (2016)	1-AUT	Divergent thinking/Creativity	$r_{\text{intraclass}} = .67 - .91$	$r = 0 - .40$	$r = 0 - .21$	$r = .01 - .34$	NI	P, N, M
Lyons and Blanchard (2016)	3-Psychomorph software program and items	Preferences in social relations	NI	NI	$r = .17$	NI	NI	N
Majors (2016)	2-Experimental Task	Aggressive behavior	NI	t-test = 3.05	t-test = 1.99	t-test = 3.08	NI	P, N, M
Malesza and Ostaszewski (2016a)	2-Delay-discounting task	Risky decision making	NI	$r = .18$	$r = .06$	$r = .09$	NI	P
	1-Stop-Signal task	Risky decision making	NI	$r = .16$	$r = .12$	$r = .06$	NI	P, N
Malesza and Ostaszewski (2016b)	2-Probabilistic-discounting task	Risky decision making	NI	$r = .04$	$r = .52$	$r = 0$	NI	N
	2-BART	Risky decision making	NI	$r = .19$	$r = .35$	$r = .01$	NI	P, N
McCain et al. (2016)	3-Smartphone app and expert appraisal	Exhibitionism in social networks	$r_{\text{intraclass}} = .40 - .75$	$r = 0 - .23$	$r = 0 - .18$	$r = .02 - .20$	NI	P, N, M
	6(app data)-Iconosquare website	Exhibitionism in social networks	NI	$r = 0 - .24$	$r = .01 - .22$	$r = .01 - .21$	NI	P, N, M
Panicheva et al. (2016)	6(machine-learning)-LIWC software	Networking language	NI	$r = .01 - .11$	$r = .02 - .08$	$r = .05 - .11$	NI	P, N, M
Parson (2016)	3-Scenarios and items	Person-Organization Fit	$\alpha = .93$	$r = .10 - .19$	$r = 0 - .23$	$r = 0 - .23$	NI	P, N, M
	3-Scenarios and items	Unethical decision making	$\alpha = .70$	$r = .33$	$r = .23$	$r = .20$	NI	P, N, M
Pfattheicher (2016)	5-Saliva samples	Testosterone	$r_{\text{intraclass}} = .67$	$r = .01$	$r = .18$	$r = .04$	NI	N
	5-Saliva samples	Cortisol	$r_{\text{intraclass}} = .82$	$r = .04$	$r = .22$	$r = .01$	NI	N
Preotiuc-Pietro et al. (2016)	6(machine-learning)-LIWC software	Networking language	NI	$r_{\text{p}} = 0 - .19$	$r_{\text{p}} = 0 - .13$	$r_{\text{p}} = 0 - .12$	NI	P, N, M
Ranadive (2016)	2-Financial Decision-making game	Risky decision making	NI	$\gamma = 0.20$	$\gamma = 0.15$	$\gamma = 0.26$	NI	None
Roeser et al. (2016)	2-Message-Task	Cheating behavior	NI	$B = 0.10$	$B = 0.40$	$B = 0.68$	NI	M

Study	Indirect assessment			Results				Conclusion
	Instrument	Variable	Reliability	With P	With N	With M	With S	
	1-Matrices-task	Cheating behavior	NI	$B = 0.51$	$B = 0.06$	$B = 0.16$	NI	P
Shobe and Desimone (2016)	5-Edinburgh Handedness Inventory (EHI)	Hand preference	NI	$r = .14$	NI	NI	NI	P
Trémolière and Djeriouat (2016)	3-Scenarios and items	Minimization of intent and responsibility	NI	$r = .01 – .51$	$r = 0 – .26$	$r = .02 – .34$	$r = 0 – .58$	P, N, M, S
Zhao et al. (2016)	3-Scenarios and items	Bribe-taking intention	$\alpha = .80$ and .85	$r = .19$ and .30	$r = .18$ and .20	$r = .28$ and .34	NI	P, N, M
	3-Paradigm/scenarios and items	Belief in good luck	$\alpha = .79$ and .89	$r = .17$ and .18	$r = .26$ and .33	$r = .09$ and .26	NI	P, N, M
Jonason et al. (2017)	1-Alternative uses objects	Divergent thinking/Creativity	$\alpha = .86$ and .99	$r = .05 – .21$	$r = .01 – .14$	$r = 0 – .16$	NI	P, N, M
Jonason and Lavertu (2017)	5-Questionnaire ad hoc	Reproductive health problems	NI	$r = .18$	$r = .14$	$r = .04$	NI	P, N
	5-Questionnaire ad hoc	Amount of pain	NI	$r = .28$	$r = .21$	$r = .28$	NI	P, N, M
	5-Questionnaire ad hoc	Number of miscarriages	NI	$r = .20$	$r = .15$	$r = .14$	NI	P, N, M
	5-Questionnaire ad hoc	Cycle length	NI	$r = .15$	$r = .20$	$r = .25$	NI	P, N, M
	5-Questionnaire ad hoc	Waist-to-hip ratio	NI	$r = .07$	$r = .19$	$r = .15$	NI	N, M
Jones and De Roos (2017)	3-Scenario and Mate Retention Inventory (MRI)	Negative mate retention tactics	NI	$r = .29$	$r = .23$	$r = .20$	NI	P, N, M
Jones and Paulhus (2017)	2-The virtual coin-flipping task	Cheating behavior	NI	$r = .15 – .23$	$r = .10 – .21$	$r = .05 – .21$	NI	P, N, M
	2-Videos and the virtual coin-flipping task	Cheating behavior	NI	$r = .01$ and .07	$r = .05$ and .10	$r = .03$ and .20	NI	M
	2-Virtual game for a financial bonus	Cheating behavior	NI	$r = .24$	$r = .05$	$r = .24$	NI	P, M
	1-OCQ	Over-claiming bias	NI	$r = .04 – .25$	$r = .03 – .29$	$r = .05 – .14$	NI	P, N, M
Kornilova and Krasavtseva (2017)	2-IGT	Risky decision making	NI	$r_p = 0 – .36$	$r_p = .01 – .28$	$r_p = .02 – .29$	NI	P, N, M
Lee and Gibbons (2017)	3-Films and items	Connection with others' suffering	$\alpha = .62 – .88$	$r = .18 – .47$	$r = .02 – .20$	$r = .07 – .15$	NI	P, N
Lopes and Yu (2017)	3-Facebook profiles and Trolling comment scale	Online trolling behaviors	$\alpha = .68$ and .70	$r = .30$ and .45	$r = .08$	$r = .16$ and .22	NI	P, M
	3-Facebook profiles and Social comparison scale	Social comparation	$\alpha = .87$ and .93	$r = .13$ and .17	$r = .28$ and .34	$r = .02$ and .22	NI	N, M

Study	Indirect assessment			Results				Conclusion
	Instrument	Variable	Reliability	With P	With N	With M	With S	
Lyons and Brockman (2017)	3-Emotional video clips	Emotional adequacy	NI	$r = .04 - .33$	$r = .01 - .22$	$r = .02 - .30$	NI	P, N, M
Lyons et al. (2017)	3-Video clips and question	Lie detection	NI	$r = .01$ and .07	$r = .05$ and .22	$r = .02$ and .10	NI	N, M
Miller et al. (2017)	4-Dirty Dozen (DD) and SD3	Dark Triad/Tetrad	$r = .41 - .51$	$r = .29$	$r = .17$	$r = .33$	NI	P, M
Oostrom et al. (2017)	3-Situational judgment tests (SJTs)	Decision making in situational judgments	$\alpha = .53 - .56$	$r = .02 - .35$	$r = .07 - .20$	$r = .10 - .31$	NI	P, M
	1- Matrices-task	Cheating behavior	NI	$r = .15$	$r = .15$	$r = .16$	NI	P, N, M
Pina et al. (2017)	3-Scenarios and Revenge Porn Proclivity Scale	Revenge Porn Proclivity	$\alpha = .76 - .87$	$r = .13 - .36$	$r = .09 - .29$	$r = .19 - .34$	$r = .02 - .16$	P, N, M
Wang (2017)	1-Experimental task to earn points	Productive and counterproductive effects of recognition	NI	NI	NI	NI	NI	P, N, M
Wissing and Reinhard (2017)	3-Videos and items	Lie detection	$\alpha = .84$ and .94	$r = .05 - .20$	$r = 0 - .12$	$r = .02 - .16$	NI	P
Amiri and Behnezhad (2018)	2-International Affective Picture System (IAPS)	Emotional recognition	NI	NI	NI	NI	NI	NI
	3-Greene's dilemmas	Utilitarian decision making	NI	NI	NI	NI	NI	NI
Anderson and Cheers (2018)	1-Go/No-go Association Task (GNAT)	Racially prejudiced attitudes	$\alpha = .72$ and .78	$r = .09$	$r = .07$	$r = .19$	NI	None
Ball et al. (2018)	3-Scenarios with Propensity for angry driving scale (PADS)	Aggressive driving behaviors	$\alpha = .70 - .93$	$r = .22 - .50$	$r = .12 - .37$	$r = .17 - .45$	NI	P, N, M
Bogolyubova et al. (2018)	6(machine-learning)-PyMorphy analyzer	Networking language	NI	$r = .07 - .11$	$r = .05 - .08$	$r = .06 - .11$	NI	P, N, M
Carre et al. (2018)	3-Consumer trust scale with scenario	Trust in company after data breach	$\alpha = .88 - .92$	$r = .28 - .40$	$r = .09 - .21$	$r = .10 - .13$	NI	P, N, M
Curtis et al. (2018)	3-Development of phishing emails and evaluation of others	Internet/social network uses	NI	$\beta = 0.02 - 0.30$	$\beta = 0.03 - 0.18$	$\beta = 0.01 - 0.16$	NI	P, N, M
Dane et al. (2018)	5-Saliva samples	Cortisol	$CV_{\text{intra-assay}} = 4.43\%$	$r_p = .43$	$r_p = .32$	$r_p = .42$	NI	P, M
	5-Saliva samples	Testosterone	$CV_{\text{intra-assay}} = 3.52\%$	$r_p = .12$	$r_p = .21$	$r_p = .54$	NI	M

Study	Indirect assessment			Results				Conclusion
	Instrument	Variable	Reliability	With P	With N	With M	With S	
	5-Saliva samples and Two truths and a lie game	Cortisol	$CV_{intra-assay} =$ 4.43%	$r_p = .49$ and .64	$r_p = .39$ and .44	$r_p = .22$ and .38	NI	P, N
	5-Saliva samples and Two truths and a lie game	Testosterone	$CV_{intra-assay} =$ 3.52%	$r_p = .52$	$r_p = .21$	$r_p = .59$	NI	P, M
Deutchman and Sullivan (2018)	2-Prisoner's dilemma	Decision making with social value (sharing)	NI	$B = 0.02$	$B = 0.01$	$B = 0.21$	NI	M
Greenier (2018)	3-Scenarios (hypotheticals) and items	Satisfaction for others' suffering	$\alpha = .69$	$r = .23$	$r = .18$	$r = .32$	NI	P, N, M
	3-Scenarios (real) and items	Satisfaction for others' suffering	NI	$r = .10$	$r = .13$	$r = .02$	NI	None
Harrison et al. (2018)	3-Scenarios and items	Unethical behavior	$\alpha = .86 - .98$	$r = .14 -$ .70	$r = .08 -$ .27	$r = .04 -$ .61	NI	P, N, M
	3-Used 4G iPhone and items	Unethical behavior	NI	$\beta = .01 -$ .30	$\beta = .01 -$ .21	$\beta = .10 -$ .38	NI	P, N, M
Hart et al. (2018a)	3-Scenarios and items	Political preferences	$\alpha = .90 - .99$	$r = .07 -$ .18	$r = .06 -$ .13	$r = .04 -$ .15	NI	P, M
Hart et al. (2018b)	3-Scenario and items	Beneficial impression management	$\alpha = .76 - .97$	$\beta = .29$	$\beta = .17$	$\beta = .32$	NI	P, N, M
Jackson (2018)	1-Baddeley reasoning test	General Intelligence/ Convergent thinking	NI	$r = .10$	$r = .12$	$r = .12$	NI	P, N, M
Karampournioti et al. (2018)	1-Message and i2 BrandREACT	Implicit brand attitude	Split-half = .87	NI	NI	NI	NI	NI
	3-Message and Interpersonal Reactivity Index (IRI)	Empathy	$\alpha = .69 - .77$	NI	NI	NI	NI	NI
	3-Message and items	Unethical decision making	$\alpha = .88$ and .93	NI	NI	NI	NI	NI
Keblusek (2018)	3-Message and items	Gossip recognition memory	NI	$r = .07$	$r = .01$	$r = .01$	NI	None
	3-Message, open question and counting units	Gossip recognition memory	NI	$r = .01$ and .02	$r = 0$ and .03	$r = .01$ and .04	NI	None
Kowalski et al. (2018)	1-Raven's Standard Progressive Matrices (SPM)	General Intelligence/ Convergent thinking	NI	$\beta = 0.18$	$\beta = 0$	$\beta = 0.31$	NI	M
Law et al. (2018)	1-Composite Faces–Short Form	Emotional recognition	$\alpha = .64$	NI	NI	NI	NI	NI
	1-Visual Search for Faces	Emotional recognition	$\alpha = .89$	NI	NI	NI	NI	NI

Study	Indirect assessment			Results				Conclusion
	Instrument	Variable	Reliability	With P	With N	With M	With S	
	1-Program N-Watch and a voice	Auditory skills	$\alpha = .77$	NI	NI	NI	NI	NI
	1-Tonal patterns	Auditory skills	$\alpha = .52$	NI	NI	NI	NI	NI
	1-Rhythmic pattern pairs	Auditory skills	$\alpha = .64$	NI	NI	NI	NI	NI
	1-BEFKI-Gc	General Intelligence/ Convergent thinking	$\alpha = .54$	NI	NI	NI	NI	NI
	1-Vocabulary Test	General Intelligence/ Convergent thinking	$\alpha = .68$	NI	NI	NI	NI	NI
	1-BEFKI-Gf	General Intelligence/ Convergent thinking	$\alpha = .69$	NI	NI	NI	NI	NI
	1-Esoteric Analogies Test (EAT)	General Intelligence/ Convergent thinking	$\alpha = .70$	NI	NI	NI	NI	NI
	3-Lie detection paradigm	Lie detection	$\alpha = .15$	NI	NI	NI	NI	NI
Modic et al. (2018)	3-Insurance claim task	Fraudulent decision making	NI	$r = .09 - .23$	$r = .04 - .13$	$r = .12 - .14$	NI	P, N, M
Moshagen et al. (2018)	2-Dictator game	Decision making with social value (sharing)	NI	$r = .14$ and .32	$r = .04$ and .19	$r = .17$ and .34	$r = .08$ and .27	P, N, M, S
	2-Coin-toss-task	Cheating behavior	NI	$r = .17$	$r = .12$	$r = .13$	$r = .10$	P, N, M, S
Moskvichev et al. (2018)	6(machine-learning)-Latent Dirichlet Allocation technique	Networking language	NI	$r = .05 - .07$	$r = .05 - .08$	$r = .05 - .07$	NI	P, N, M
Noser et al. (2018)	5-ImageJ software	Facial width-to-height ratio	$\alpha = .99$	$r_p = .10$	$r_p = .03$	$r_p = .09$	NI	None
	5-Saliva samples	Testosterone	$CV_{intra/inter-assay} = 1.47\%$ and 6.69%	$r_p = .06$	$r_p = .21$	$r_p = .12$	NI	None
Pajevic et al. (2018b)	1-Reading the Mind in the Eyes test (RMET)	Emotional recognition	$\alpha = .51$	$r = .12$	$r = .03$	$r = .01$	$r = .14$	P, S
Rasmussen and Boon (2018)	3-Scenarios and open question	Emotion management	NI	NI	NI	NI	NI	NI
Vander Molen et al. (2018)	4-Brief Dark Triad Scale	Dark Triad/Tetrad	$\alpha = .68 - .82$	$r_p = .18$	$r_p = .22$	$r_p = .10$	NI	N
Wissing and Reinhard (2018)	3-Scenarios and items	Risk perception of artificial intelligence	$\alpha = .84$ and .89	$r = .10$ and .26	$r = .03$ and .16	$r = .04$ and .19	NI	P, N, M
Appel et al. (2019)	3-Video clips and items	Emotional responses to eudaimonic narratives	$\alpha = .77$ and .97	$r = .09 - .18$	$r = 0 - .12$	$r = .08 - .09$	NI	P

Study	Indirect assessment			Results				Conclusion
	Instrument	Variable	Reliability	With P	With N	With M	With S	
Atkinson (2019)	1- Reading Span Task (RSPAN)	Working memory	NI	$r = .06$	$r = .14$	$r = .06$	NI	None
	1-Go/no-go task	Impulsivity	NI	$r = .07$	$r = .16$	$r = .01$	NI	None
	1-Task switching paradigm	Task-switching ability	NI	$r = .08$	$r = .06$	$r = .16$	NI	None
Bensch et al. (2019)	3-Vocabulary and Overclaiming Test (VOC-T) and questionnaire	Over-claiming bias	$\omega = .64$	$r = .05$	$r = .13$	$r = .08$	NI	N
Borráz-León et al. (2019)	5-Opensource ImageJ software version 1.42	Facial asymmetry	$r_{intraclass} = .95$	$r_p = .02$	$r_p = .28$	$r_p = .13$	NI	N
	5-Digital caliper	Finger length	$r_{intraclass} = .89$ and .90	$r_p = .11$ and .16	$r_p = .10$ and .22	$r_p = .12$	NI	N
Buckels et al. (2019)	3-Photographs and items	Perception of others' pain	$\alpha = .39$	$r = .23$	$r = .09$	$r = .14$	$r = .27$	P, M, S
	3-Photographs and items	Satisfaction for others' suffering	$\alpha = .68$	$r = .42$	$r = .13$	$r = .23$	$r = .46$	P, N, M, S
Chester et al. (2019)	2-Cyberball paradigm and Voodoo Doll Aggression Task (VDAT)	Aggressive behavior	NI	$r = .06$	$r = .03$	$r = .03$	$r = .14$	S
	2-Taylor Aggression Paradigm (TAP)	Aggressive behavior	$\alpha = .98$	$r = .14$	$r = .26$	$r = .14$	$r = .04$	P, N, M
Chung et al. (2019)	6(app data)-Social tracker application, built-in battery, and a form	Internet/social network uses	NI	$r = .03$ and .16	$r = .04$ and .05	$r = .06$ and .08	$r = .14$ and .17	None
	1-Go/no-go task	Impulsivity	NI	$r = .01$	$r = .01$	$r = .04$	$r = .11$	None
Clemente et al. (2019)	3-Scenarios and items	Unethical decision making	$\alpha = .93$	$r = .17$ and .22	$r = .11$ and .16	$r = .20$ and .23	NI	P, N, M
Dryden and Anderson (2019)	1-GNAT	Associative self-objectification	NI	$r = .02$	$r = .08$	$r = .01$	NI	None
	3-Photographic Figure Rating Scale (PRFS)	Body image concerns	NI	$r = .11$	$r = .15$	$r = .17$	NI	N, M
D'Souza et al. (2019)	2-Lottery and joint manipulation methods	Cheating behavior	$r_{intraclass} = .44$	$r = .17$	$r = .11$	$r = .23$	NI	P, M
Duran et al. (2019)	3-Videos and items	Lie detection	NI	NI	NI	NI	NI	NI
Greitemeyer et al. (2019)	3-Video games trailers and items	Preference for violent videogames/movies	$\alpha > .87$	$r = .04 – .34$	$r = .01 – .19$	$r = 0 – .16$	$r = .02 – .34$	P, N, M, S

Study	Indirect assessment			Results				Conclusion
	Instrument	Variable	Reliability	With P	With N	With M	With S	
Hart et al. (2019)	3-Scenarios and items	Beneficial impression management	α = .94 and .95	r = .01 – .12	r = 0 – .14	r = .06 – .51	NI	P, N, M
Jonason et al. (2019)	3-Scenarios and Defense Mechanisms Inventory	Emotion management	α = .60 – .90	r = .19 and .43	r = .21	r = .25 and .50	NI	P, N, M
Josephs et al. (2019)	3-Scenarios and items	Preferences in social relations	α = .90	F = 7.11	F = 6.38	NI	NI	P, N
Karandikar et al. (2019)	3-Greene's dilemmas	Utilitarian decision making	$r_{\text{inter-rater}}$ = .79	r = .27 and .37	r = .13 and .22	r = .18 and .35	r = .24 and .34	P, N, M, S
Kaufman et al. (2019)	2-Conspicuous consumption- Extra money scale	Consumerist decision making	NI	NI	NI	NI	NI	NI
	3-Dilemmas and items	Utilitarian decision making	NI	NI	NI	NI	NI	NI
	2-Dictator game	Decision making with social value (sharing)	NI	NI	NI	NI	NI	NI
Moor et al. (2019)	1-GNAT	Negative attitudes towards gay men	RaSSH = .76 and .81	r = .14	r = .01	r = .10	r = .03	None
Pfattheicher et al. (2019)	2-Dice-rolling paradigm and watching eyes condition	Cheating behavior	NI	NI	NI	NI	NI	NI
	2-Tossing a coin paradigm and watching eyes condition	Cheating behavior	NI	NI	NI	NI	NI	NI
Prichard (2019)	5-EHI	Hand preference	NI	β = 0.14	β = 0.01	β = .10	NI	P
Ritchie et al. (2019)	3-Videos and Open-ended questions	Perception of nonverbal behavior	$r_{\text{intraclass}}$ = .94	r = .02 – .26	r = .01 – .12	r = .01 – .21	r = .01 – .23	P, M, S
Schimmenti et al. (2019)	1-RMET	Emotional recognition	α = .64	r = .19	r = .02	r = .09	NI	P, M
Tetreault and Hoff (2019)	3-The Anagram task and items	Emotion management	NI	β = 0.02	β = 0.05	β = 0.05	NI	None
	3-The Anagram task and items	Ability to predict performance	NI	β = 0.01	β = 0.02	β = 0.03	NI	None
Tortoriello et al. (2019)	3-Scenarios and items	Interpersonally harmful behavior	$r_{\text{intraclass}}$ = .39 – .68	β = 0.01 – 0.36	β = 0.02 – 0.10	β = 0.08 – 0.28	β = 0.01 – 0.42	P, M, S
Wang et al. (2019)	3-Buddhist Patience Questionnaire (BPQ) with scenarios	Emotion management	α = .72 – .85	r = .37 – .51	r = .33 – .42	r = .23 – .42	NI	P, N, M

Study	Indirect assessment							Conclusion
	Instrument	Variable	Reliability	With P	With N	With M	With S	
Wertag and Bratko (2019)	6(survey)-Repeat a survey	Prosocial behavior	NI	$r = .12$	$r = .17$	$r = .12$	NI	P, N, M
Bill et al. (2020)	3-Scenarios and items	Social desirability	$\alpha = .79$ and .96	$r = 0$ and .05	$r = .03$ and .04	$r = .02$ and .04	NI	None
Breeden et al. (2020)	3-Scenario and items	Beneficial impression management	$\alpha = .93$	$r = .13$	$r = .06$	$r = .17$	NI	P, M
Carré et al. (2020b)	2-Opportunity Perception Task	Opportunistic decision making	NI	$r = 0$ and .03	$r = .05$	$r = .06$ and .09	NI	M
Clemente et al. (2020)	3-Scenarios and items	Unethical decision making	$\alpha = .92 - .95$	$\beta = 0.80$ and 0.83	$\beta = 0.57$ and 0.48	$\beta = 0.21$ and 0.32	NI	P, N, M
Curtis and Jones (2020b)	3-General Causality Orientations Scale (GCOS; with vignettes)	Motivation	$\alpha = .68 - .83$	NI	NI	NI	NI	NI
Erzi (2020)	3-Scenarios and items	Satisfaction for others' suffering	$\alpha = .94$ and .96	$r = .23$ and .34	$r = .25$ and .31	$r = .34$ and .35	NI	P, N, M
Fido et al. (2020)	1-IAT	Nature connectedness	NI	$r = .11$	$r = .04$	$r = .20$	$r = .10$	M
Hart et al. (2020)	3-Scenarios and items	Darkness tolerance - Darkness desirability	$\alpha = .27 - .94$	$r = .03 - .49$	$r = .01 - .15$	$r = 0 - .35$	$r = .08 - .57$	P, N, M, S
Hart and Richardson (2020)	3-Scenarios and items	Darkness tolerance - Darkness desirability	$\alpha = .86 - .89$	$\beta = 0.28$	$\beta = 0.10$	$\beta = 0.21$	NI	P, N, M
Jonason and Sherman (2020)	3-Situational diamonds (S8)	World perception	$\alpha = .65 - .91$	$r = 0 - .26$	$r = 0 - .20$	$r = 0 - .37$	NI	P, N, M
Jonason et al. (2020)	2-Questions–ipsative options	Risky decision making	$\alpha = .91$	$r = .15$	$r = .17$	$r = .05$	$r = .12$	P, N
Kajonius and Björkman (2020)	1-International Cognitive Ability Resource (ICAR16)	General Intelligence/ Convergent thinking	$\alpha = .74$	$r = .09$	$r = .19$	$r = .05$	NI	N
	1-Multifaceted Empathy Test (MET)	Emotional recognition	$\alpha = .97$	$r = .05$	$r = .17$	$r = .09$	NI	N
Kapoor and Khan (2020)	1-Divergent Thinking task	Divergent thinking/Creativity	$r_{intraclass} \geq .70$	NI	$\beta = 0.01 - 0.12$	$\beta = 0 - 0.15$	NI	None
Kay and Saucier (2020)	3-97 trait adjectives	Moral normativity	$r = .96$ and .98	$r = .18 - .35$	$r = .01 - .04$	$r = .01 - .28$	NI	P, M
Koehn et al. (2020)	5-Questions and reverse cycle day method	Probability of conception	NI	NI	$r = .25$	NI	NI	N
Koscielska et al. (2020)	3-Scenarios and TOSS	Unethical decision making	$\alpha = .96$ and .97	$r = .33 - .43$	$r = .29 - .37$	$r = .21 - .35$	$r = .32 - .41$	P, N, M, S

Study	Indirect assessment			Results				Conclusion
	Instrument	Variable	Reliability	With P	With N	With M	With S	
Kuzmicheva (2020)	2-Prisoner's dilemma	Decision making with social value (sharing)	NI	NI	NI	$B = .01 – .02$	NI	M
Malesza (2020)	2-Prisoner's dilemma	Decision making with social value (sharing)	NI	$\beta = 0.50$	$\beta = 0.06$	$\beta = 0.34$	NI	P, M
Malesza and Kaczmarek (2020)	4-SRP-III, NPI-17, MACH-IV	Dark Triad/Tetrad	$\alpha = .93 – .98$	$r = .46$	$r = .33$	$r = .49$	NI	P, N, M
Michels et al. (2020)	1-Wechsler Adult Intelligence Scale (WAIS-IV)	General Intelligence/ Convergent thinking	NI	$r = .09 – .34$	$r = .01 – .23$	$r = .01 – .14$	NI	P
	2-Development of three stories	Ability/Attitude to lie	$\alpha = .62$	$r = .14$	$r = .09$	$r = .02$	NI	None
Neumann et al. (2020)	3-Dilemmas and items	Utilitarian decision making	NI	NI	NI	NI	NI	NI
	2-Dictator game	Decision making with social value (sharing)	NI	NI	NI	NI	NI	NI
Nicholls et al. (2020)	1- Matrices-task	Cheating behavior	NI	$r = .37$	$r = .41$	$r = .39$	NI	P, N, M
Nuzulia and Why (2020)	1-Raven's Advanced Progressive Matrices (APM)	General Intelligence/ Convergent thinking	NI	$r = .02$ and .07	$r = .09$	$r = .01$ and .11	NI	None
Sagioglou and Greitemeyer (2020)	3-Dip another person's hands in cold water	Antisocial decision making	NI	$r = .28$	$r = .01$	$r = .23$	$r = .24$	P, M, S
	3-Video clips	Preference for violent videogames/movies	NI	NI	NI	NI	NI	NI
	3-Dip hands in cold water and items	Masochistic behavior	Spearman-Brown $\rho = .87$	$r = .07$	$r = .10$	$r = .03$	$r = .05$	None
	3-Tasting drinks and items	Bitter taste preferences	NI	$r = .13$	$r = .07$	$r = .08$	$r = .10$	P, S
Schmitt et al. (2020)	1-RMET	Emotional recognition	NI	$r_p = .11 – .26$	$r_p = .07 – .16$	$r_p = .04 – .18$	NI	P
Scott et al. (2020)	3-Twitter screenshots and items	Emotion understanding	$\alpha = .72$ and .94	$r = .10 – .25$	$r = .02 – .27$	$r = .10 – .15$	NI	P, N, M
Sekścińska and Rudzinska-Wojciechowska (2020)	2-Investment risk propensity task	Risky decision making	NI	$r = .18$	$r = .20$	$r = .07$	NI	P, N, M
	2-Gambling risk-taking propensity task	Risky decision making	NI	$B = 0.02$ and 0.08	$B = 0.08$	$B = 0.02$ and 0.04	NI	P, N, M

Study	Indirect assessment			Results				Conclusion
	Instrument	Variable	Reliability	With P	With N	With M	With S	
Semrad and Scott-Parker (2020)	1-MSCEIT	Emotional intelligence	α = .72 – .95	NI	NI	NI	NI	NI
	2-DeceIT	Ability/Attitude to lie	NI	r = .03 and .06	r = .10	r = .05 and .08	NI	None
Sorokowski et al. (2020)	6(app data)-Online comment analysis	Networking language	NI	β = 1.37	β = 0.04	β = 0.08	NI	P
Van Doesum et al. (2020)	2-Social mindfulness paradigm (SoMi)	Prosociality	NI	r = .08	r = .23	r = .02	NI	N
Bernard et al. (2021)	2-Behavioral Body Inversion Paradigm (B-BIP)	Cognitive objectification of women's bodies	α = .72	r = .14	r = .10	r = .21	NI	P, N, M
Blagov (2021)	3-Public-health messages and items	Health behavior endorsement	α = .93 – .95	r_p = 0.08 – 0.26	r_p = 0.04 – 0.12	r_p = 0.03 – 0.23	NI	P, N, M
Bolellí (2021)	2-A version of dictator game	Decision making with social value (sharing)	NI	β = 0.80	NI	NI	NI	P
Burtăverde and Ene (2021)	3-Scenario and attributes in Likert scale	Preferences in social relations	NI	r = .01 – .26	r = .01 – .32	r = .01 – .34	NI	P, N, M
	3-Scenario and preferences in Likert scale	Preferences in social relations	NI	r = .01 – .32	r = .07 – .40	r = .02 – .27	NI	P, N, M
Curtis et al. (2021)	2-The FlipIt game	Decision making for strategic resource control	NI	r = .01 – .11	r = .01 – .14	r = .03 – .10	NI	P, N, M
D'Agata et al. (2021)	3-Scenario and items	Self-disclosure to establish relations	NI	r = .04 – .22	r = .03 – .22	r = .03 – .21	NI	P, N, M
Dinić et al. (2021)	3-Bartels and Pizarro's dilemmas	Utilitarian decision making	NI	r = .20 – .27	r = .17 – .21	r = .18 – .27	r = .20 – .28	P, N, M, S
Doerfler et al. (2021)	2-Disease problem	Risky decision making	NI	B = 1	NI	NI	NI	P
Forsyth et al. (2021)	3-Scenarios and items	Ability/Attitude to lie	α = .54 – .79	r = .16 – .32	r = .08 – .39	r = .16 – .47	r = .19 – .42	P, N, M, S
Geher et al. (2021)	3-Estrangement History and items	Social alignment	NI	r = .20	r = .13	r = .15	NI	P, N, M
	3-Scenarios and items	Social alignment	NI	r = 0 – .34	r = .08 – .28	r = 0 – .30	NI	P, N, M
Geng et al. (2021)	5-Blood collection tubes	White blood cell	NI	r = 0.05	r = 0.15	r = 0.09	NI	N
Gomes-Arrulo et al. (2021)	1-Arithmetic verification tasks	Cognitive performance	NI	NI	NI	NI	NI	NI

Study	Indirect assessment			Results				Conclusion
	Instrument	Variable	Reliability	With P	With N	With M	With S	
	1-Arithmetic verification tasks, stress-inducing paradigm, and items	Perceived stress	NI	NI	NI	NI	NI	NI
Greenwood et al. (2021)	3-Scenario and items from different scales	Affinity for morally ambiguous characters	$\alpha = .78 - .89$	$r = .19 - .40$	$r = .03 - .24$	$r = .24 - .33$	NI	P, N, M
Grover and Furnham (2021)	2-Lottery questions with scenario	Risky decision making	NI	NI	$r = .11$ and .31	$r = .18$ and .39	NI	N, M
	2-BART	Risky decision making	NI	NI	$r = .39$ and .54	$r = .42$ and .53	NI	N, M
Guo, Zhang, De Fruyt et al. (2021)	1-AUT	Divergent thinking/Creativity	$\alpha = .78 - .90$	$r = .06 - .07$	$r = .05 - .08$	$r = .03 - .06$	NI	None
Guo, Zhang and Pang (2021)	1-AUT	Divergent thinking/Creativity	$\alpha = .78$	$r = .07$	$r = .08$	$r = .03$	NI	None
Kapoor et al. (2021)	3-Scenarios and items	Unethical decision making	$\alpha = .89 - .96$	$\beta = 0.03 - 0.35$	$\beta = 0.04 - 0.45$	$\beta = 0.22 - 0.30$	NI	P, N, M
Koschmieder and Neubauer (2021)	3-Emotion Regulation in Pedagogical Situations (ERIPS)	Emotional regulation	$r_{intraclass} = .79$	$r = .22 - .31$	$r = .18 - .24$	$r = .20 - .26$	NI	P, N, M
	3-Situational Test of Emotional Understanding (STEU)	Emotion understanding	NI	$r = .01$	$r = .04$	$r = .16$	NI	M
	3-Situational Test of Emotion Management (STEM)	Emotion management	NI	$r = .30$	$r = .23$	$r = .16$	NI	P, N, M
Kückelhaus et al. (2021)	1-Diagnostic Analysis of Nonverbal Accuracy (DANVA2)	Emotional recognition	$\alpha = .75$	NI	NI	$r = .15$	NI	M
Laakasuo et al. (2021)	3-Greene's dilemmas	Utilitarian decision making	$\alpha = .85$	$r = .23$	$r = .09$	$r = .26$	NI	P, N, M
	3-Scenarios and items	Mind upload acceptance	$\alpha = .91$	$r = .15$	$r = .01$	$r = .18$	NI	P, M
Lämmle et al. (2021)	4-Self-Report Psychopathy Scale-III (SRP-III), Narcissistic Personality Inventory (NPI-40), Machiavellianism test IV (MACH-IV)	Dark Triad/Tetrad	$\alpha = .44 - .86$	$r = .37 - .59$	$r = .41 - .72$	$r = .12 - .30$	NI	P, N, M

Study	Indirect assessment			Results				Conclusion
	Instrument	Variable	Reliability	With P	With N	With M	With S	
Lämmle and Ziegler (2021)	1-Operation Span Task (AOSPAN)	Working memory	NI	$r = .06$	$r = .15$	$r = .01$	NI	None
	1-AOSPAN and White-noise paradigm	Self-harming behavior	NI	$\beta = 0.18$	$\beta = 0.17$	$\beta = 0.04$	NI	None
	2-Lightning Reaction Reloaded	Self-harming behavior	NI	$r = .25$ and .26	$r = .06$ and .08	$r = .25$ and .29	NI	P, M
Mahmud et al. (2021)	6(machine-learning)-Random Forest, Support Vector Machine, and Naïve Bayes algorithms	Dark Triad/Tetrad	NI	Accuracy ≈ 0.65	Accuracy ≈ 0.59	Accuracy ≈ 0.91	NI	M
Malesza and Kalinowski (2021a)	2-Delay-discounting task	Risky decision making	NI	$r = .44$	$r = .34$	$r = 0$	NI	P, N
Malesza and Kalinowski (2021b)	2-Delay-discounting task	Risky decision making	NI	$r = .52$	$r = .46$	$r = .09$	NI	P, N
	2-Social-discounting task	Decision making with social value (sharing)	NI	$r = .57$	$r = .42$	$r = .39$	NI	P, N, M
Markowitz and Levine (2021)	1-Matrices-task	Cheating behavior	NI	$r = .15 - .58$	$r = .05 - .06$	$r = .08 - .16$	NI	None
Nai and Maier (2021)	3-Scenarios and items	Political attitudes	$\alpha = .88$ and .90	$r^2 = .01 - .36$	$r^2 = .01 - .29$	$r^2 = .01 - .25$	NI	P, N
	3-Scenarios and items	Political attitudes	$\alpha = .95$	$r^2 = 0 - .39$	$r^2 = .05 - .25$	$r^2 = .02 - .31$	NI	P, N, M
Ok et al. (2021)	3-Shoes photos and items	Unethical decision making	NI	NI	NI	NI	NI	NI
	3-Scenarios and items	Unethical decision making	$\alpha = .46$ and .89	$r = .26$ and .40	$r = .16$ and .30	$r = .21$ and .33	NI	P, N, M
Puthillam, Karandikar, and Kapoor (2021)	1-Geneva Emotion Recognition Test-Short Version (GERT-S)	Emotional recognition	NI	$r = .11$ and .16	$r = .23$	$r = .12$	NI	P, N
Puthillam, Karandikar, Kapoor and Parekh (2021)	3-Scenarios and items	Gratitude state	$\alpha = .73$	$r = 0$ and .07	$r = .08$ and .12	$r = .02$ and .03	NI	N
Quan et al. (2021)	5-Chelex-100 method	Genotyping - BDNF Val66Met)	NI	$\beta = 0 - 0.04$	$\beta = 0.03 - 0.12$	$\beta = 0.06 - 0.11$	NI	N, M

Study	Indirect assessment			Results				Conclusion
	Instrument	Variable	Reliability	With P	With N	With M	With S	
Vaughan and Madigan (2021)	1-Basketball free-throw task	Sport performance	NI	$r = .11$ and .13	$r = .13$ and .16	$r = .10$ and .12	NI	P, N, M
Wilkinson and Dunlop (2021)	3-Quantifying narrative themes	Understanding and assuming responsibility	$\alpha = .86$ and .91	$r = .03$ and .24	$r = .02$ and .17	$r = .01$ and .15	NI	P
Zirenko et al. (2021)	3-Verbal tasks-scenarios with items	Mask-wearing decision making	NI	$B = 0.11 - .22$	$B = 0.07 - .21$	NI	NI	P, N
Hart et al. (2022)	3-Antagonism-confirmation task	Antagonistic personality	$\alpha = .77$	$r = .03 - .84$	$r = .01 - .81$	$r = .01 - .75$	$r = .02 - .85$	P, N, M, S
Yuan et al. (2022)	6(machine-learning)-LIWC software	Network language	NI	$r = 0 - .21$	$r = .04 - .19$	$r = .05 - .24$	NI	P, N, M

Note. The numbers appearing in the Variable column indicate to which category the variable belongs, where 1 = OPTs masked as achievement tasks, 2 = OPTs that aim to represent real-life simulations, 3 = Questionnaire-type OPTs that ask for evaluations or decisions, 4 = Objective measure in peer-report format, 5 = Objective measure in biomedical data format, 6 = Other; P = psychopathy; N = narcissism; M = Machiavellianism; S = sadism; NI = Not indicated; α = Cronbach's alpha; ω = McDonald's Omega; r = Pearson correlation; r_p = Partial correlation; r^2 = determination coefficient; B = Unstandardized regression coefficient; β = Standardized regression coefficient; F = two-variance coefficient; WRMR = Weighted Root Mean Square Residual; RaSSH = Random Sample of Split Halves; RF model = Random Forest model; γ = Gamma estimator. When an instrument measures more than two variables, we have indicated the range of values (X - X). In the conclusion's column, the Dark Tetrad traits that are associated with the variable indicated in each study are indicated.

Table 2

Categories of the Instruments for Indirect Assessment of Dark Triad and Dark Tetrad Traits and Measured Variables

Categories	Variables
(1) OPTs masked as achievement tasks	General intelligence/convergent thinking and divergent thinking/creativity, over-claiming bias, verbal ability, auditory skills, working memory, harmful and self-harming behavior, emotional intelligence, emotional recognition, risky decision making, cheating behavior, productive and counterproductive effects of recognition, racial prejudice, implicit branding, or negative attitudes toward gay men, associative self-objectification, impulsivity, task-switching ability, nature connectedness, cognitive performance, perceived stress, and sport performance.
(2) OPTs that aim to represent real-life simulations	Risky, opportunistic, social value (sharing), strategic control, and consumerist decision making, cheating behavior, lie detection and ability/attitude to lie, preferences in social relations, cooperative attitude, sadistic task choice, self-harming behavior, theft decision making, ability to negotiate, aggressive behavior, emotional recognition, prosociality, and cognitive objectification of women's bodies.
(3) Questionnaire-type OPTs that ask for evaluations or decisions	Racial, violent, and political attitudes, cheating behavior, interpersonal assessment of vulnerability in others, utilitarian, unethical, antisocial, fraudulent, mask-wearing, opportunistic, and situational judgmental decision making, perception, connection and satisfaction for others' suffering and pain, sexual tactics, unethical behavior, moral normativity, interpersonally harmful behavior, emotional intelligence, emotion management, adequacy and understanding, emotional regulation, empathy, political, social relations and violent videogames/movies preferences, social desirability, beneficial impression management, conditional reasoning for aggression, exhibitionism in social networks, Internet/social network uses, person-organization fit, minimization of intent and responsibility, bribe-taking intention, belief in good luck, negative mate retention tactics, online trolling behaviors, social comparation, lie detection, ability/attitude to lie, revenge porn proclivity, aggressive driving behaviors, trust in company after data breach, gossip recognition memory, risky perception of artificial intelligence, emotional responses to eudaimonic narratives, over-claiming bias, body image concerns, perception of nonverbal behavior, ability to predict performance, motivation, darkness tolerance – darkness desirability, world perception, masochist behavior, bitter taste preferences, health behavior endorsement, self-disclosure to establish relations, social alignment, affinity for morally ambiguous characters, mind upload acceptance, gratitude state, understanding and assuming responsibility, and antagonistic personality.
(4) Objective measure in peer-report format	Dark Triad and Dark Tetrad traits by through of an informant (such as family members or friends).
(5) Objective measure in biomedical data format	Testosterone, cortisol, hand preference, probability of conception, reproductive health problems, amount of pain, number of miscarriages, cycle length, waist-to-hip and facial width-to-height ratio, facial asymmetry, finger length, white blood cell, and genotyping.
(6) "Other"	Networking language, mimicry behavior, exhibitionism in social networks, Internet/social network uses, prosocial behavior, and the Dark Triad and Dark Tetrad traits with machine-learning.

study was to summarize the instruments that have been used to assess more indirectly (i.e., different from the self-report assessment) the traits of the Dark Triad and the Dark Tetrad. Specifically, objective tools used to assess characteristics related to these dark traits were collected (Cattell & Warburton, 1967; Furr, 2009; Kubinger, 2009; Hernández-López et al., 1999; McDonald, 2008; Santacreu, 2009; Santacreu & Hernández, 2018). For this purpose, a systematic review of the existing literature was carried out, which resulted in many studies that met the established inclusion criteria.

Firstly, it is important to note that the only objective instruments designed to concretely assess Dark Triad or Dark Tetrad traits (and not variables related to them) are peer-reports and machine-learning techniques (included in the "other" category in this review) (e.g., Mahmud et al., 2021; Malesza & Kaczmarek, 2020; Rogers et al., 2018). That is, most of the designed instruments objectively assess constructs related to these dark traits and, thus, can be considered indirect and objective measures to assess these malevolent traits, but not specifically assessing the traits. Machine-learning, which had not been considered as a category for classifying measures due to ignorance, has made significant advances in society and is a tool that is currently advancing the objective prediction of human behavior and personality traits (Bleidorn & Hopwood, 2019). Perhaps, future work should include it as a new category to classify objective measures.

As has been seen, OPTs require the person to perform tests or situational tasks that allow the assessment of their personality based on their behavior in those tests, so that their personality is being assessed by evaluating variables defined in the context of those tests and tasks. Therefore, this can be considered a way of objectively and indirectly assessing personality, by assuming that traits are expressed through observable behavior in standardized tasks or situations. Therefore, they can be measured by assessing the characteristics related to them (Cattell & Warburton, 1967; Furr, 2009; Kubinger, 2009; Hernández-López et al., 1999; McDonald, 2008; Santacreu, 2009; Santacreu & Hernández, 2018).

Secondly, regarding the characteristics of the studies that met the inclusion criteria, it is interesting to note that before 2010, only two studies were found, possibly because it was in 2010 when the first specific self-report to measure the three Dark Triad traits was validated (i.e., the Dirty Dozen; Jonason & Webster, 2010), a time when the authors might be more interested in directly assessing the Dark Triad traits. It is also interesting to mention that as of 2016 is when it seems that interest in the use of indirect measures increased, as the number of localized publications began to increase. In addition, the year 2021 is the year in which the largest number of publications was located, also considering that the search was up to April 2021 (the whole year was not covered). This would highlight the authors' increased interest in recent years in using more indirect tools other than self-report (Hernández-López et al., 1999; Lozano-Bleda et al., 2010; Rubio et al., 2004; Santacreu & Hernández, 2018).

Fewer papers have been located that have included in their studies the assessment of the Dark Tetrad along with the objective assessment of related constructs. Therefore, fewer indirect instruments for assessing the Dark Tetrad have been located, which could be due to the later inclusion of the trait sadism (Chabrol et al., 2009) and the recent design of specific self-reports for the assessment of this trait (Paulhus et al., 2020; Plouffe et al., 2017; Webster & Wongsomboon, 2020).

To obtain a joint and specific view of the type of objective measures used in the studies, a classification into 6 categories was proposed, following the classification published by Ortner and Proyer in 2015 and adding another two categories after reviewing the published literature (Abernethy, 2015; Cattell & Warburton, 1967; Connelly & Ones, 2010; Furr, 2009; Hundleby, 1973; McDonald, 2008): 1 = OPTs masked as achievement tasks, 2 = OPTs that aim to represent real-life simulations, 3 = Questionnaire-type OPTs that ask for evaluations or decisions, 4 = Objective measure in peer-report format, 5 = Objective measure in biomedical data format, 6 = Other (instruments that did not fit the other categories).

Most of the instruments were classified into one of the three categories proposed by Ortner and Proyer (2015), so most of the objective instruments (1) are masked as performance tasks in which participants have to solve some achievement task as accurately and/or as quickly as possible (e.g., Guo, Zhang, De Fruyt, et al., 2021; Lämmle & Ziegler, 2021; Markowitz & Levine, 2021); (2) are presented as tasks representing real-life simulations, in which they have to solve some task of lesser or greater complexity embedded in a real-life situation or scenario (e.g., Grover & Furnham, 2021;

Malesza & Kalinowski, 2021b; Van Doesum et al., 2020); or (3) are designed as questionnaire-like tasks, in which they have to answer questionnaire-like items (e.g., Koschmieder & Neubauer, 2021; Laakasuo et al., 2021; Ok et al., 2021).

Many of the measures used in these studies were published even before the main self-reports for measuring the Dark Triad and the Dark Tetrad, although they have been subsequently versioned (such as The Balloon Analogue Risk Task, Greene's dilemmas and Bartels' dilemmas, Raven's progressive matrices, or the Dictator game; Bartels, 2008; Eckel & Grossman, 1996; Greene et al., 2004; Lejuez et al., 2002; Raven, 1981). Thus, their use is very well known, which is perhaps why more evidence of this style has been located.

As for the variables measured with these instruments that have been related to the malevolent traits of the Dark Triad and Dark Tetrad, a great variety of them have been located. This is interesting because it provides authors with a broad variety of variables that they could add to their studies when they intend to measure dark traits more indirectly and differently from self-reports (Cattell & Warburton, 1967; Furr, 2009; Kubinger, 2009; Hernández-López et al., 1999; McDonald, 2008; Santacreu, 2009; Santacreu & Hernández, 2018).

Finally, those studies that have provided values on the relationship between the Dark Triad or Dark Tetrad traits and the other variables (i.e., the variables defined in the context of the tests and that, therefore, assess the traits through their measurement) provide meaning to the possible usefulness of the instruments used. That is, in the cases where significant relationships between variables have been obtained, it can be concluded that the tools used in those studies were useful for indirectly assessing the malevolent traits of interest. In any case, it is also important to consider the reliability values to make decisions and, in many studies, these were not reported.

Traits that are socially less acceptable, as is the case of the Dark traits, and which, therefore, are assessed in the context of forensic psychology, are more likely to present biases in their assessment (such as social desirability) (Echeburúa et al., 2011; Spaans et al., 2017). For this reason, it seems relevant to include in their assessment other types of measures different from self-reports (or in addition to) to be able to obtain data from different methods and, thus, greater reliability in the conclusions drawn (Kyllonen & Kell, 2018; McDonald, 2008; Ortner & Proyer, 2015).

Limitations and Future Research

The present systematic review presents some limitations. Among them, we underline the difficulty in classifying all the objective measures following a previous classification model due to the lack of studies on this subject. As indicated by Ortner and Proyer (2015) in their study, OPTs form a very heterogeneous group of tests, and there seems to be no clear classification that gathers all the types of OPTs designed so far. Therefore, an alternative classification of five categories (plus the "other" category) was proposed in this work, among which the three categories proposed by Ortner and Proyer (2015) were included. However, there were some doubts about classifying some of the instruments because some of them seemed to fit into two categories, which involved a search for consensus among the different reviewers. Therefore, a future line of research is to further deepen the study of the classification proposed by Ortner and Proyer (2015) and revise the classification of five categories (plus "others") proposed in this work.

Another limitation of this study is that, having included only those studies that had analyzed at least three of the traits (i.e., Machiavellianism, narcissism, and psychopathy, which comprise the Dark Triad)—we aimed to analyze the traits as they were initially conceived so as to analyze the Dark Triad and the Dark Tetrad themselves—studies that employed objective measures of interest but evaluated only one or two of the traits may have been excluded. Their inclusion would have resulted in the inclusion of a very large number of studies but this is proposed as a future line of research.

Finally, although it was not an objective of this work to analyze the relationships between the Dark Triad and Dark Tetrad traits with the variables defined in the context of the tests, a limitation of this work is that, given the lack of values on such relationships in some of the studies, it was impossible to conclude in all cases whether or not the instrument could be useful for measuring dark traits. As a future line of research, it is proposed to continue using such instruments and further analyze the relationships.

Conclusions

This is the first systematic review that collects all the objective instruments used for the indirect assessment of Dark Triad and Dark Tetrad traits 20 years after the publication of this set of malevolent traits. Many tools have been presented which, by means of their application, allow assessing these traits through the measurement of variables defined in the context of such measures. These results offer authors a wide range of measures they could include in their studies when they want to deal with self-report biases and obtain more reliable results (Hernández-López et al., 1999; Lozano-Bleda et al., 2010; Rubio et al., 2004; Santacreu & Hernández, 2018).

However, objective measures are not free from errors in their measurement, as some authors point out that there may be weak correlations between self-report and behavioral measures of the same construct, hindering their use (Dang et al., 2020; Ortner & Proyer, 2015). These authors suggest using only measures with high reliability for investigating individual differences, leaving the use of measures with low reliability to predict only the increase or decrease of an attribute for the same individual in the short term (Dang et al., 2020).

In any case, and as indicated by different authors (Kyllonen & Kell, 2018; McDonald, 2008; Ortner & Proyer, 2015), the best assessment will always combine different measurement methods. Therefore, researchers are encouraged to continue employing in their studies on the assessment of Dark Triad and Dark Triad traits the objective instruments collected in this systematic review, as well as to continue designing new tools to provide more results on the validity of such measures and their correlation with self-reports (Ortner & Proyer, 2015). To this set of measures collected in this review we propose to mention them as Objective Personality Measures (OPMs), considering the new classification of 6 categories that in this work we propose, and considering the inclusion of the OPTs of Ortner and Proyer (2015) and other types of tools different from tests.

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Appendix 7

Study 7

Observer-reports as a complement to self-reports in the assessment of Dark Triad: a meta-analysis

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Observer-reports as a complement to self-reports in the assessment of Dark Triad: a meta-analysis

Abstract

When assessing malevolent personality some biases must be faced, especially social desirability. To address this issue, observer-reports are an effective complement to self-reports. The aim of this meta-analysis was to investigate the accuracy of observer-reports for assessing the Dark Triad and Dark Tetrad traits and to determine whether this assessment method can be useful to measure indirectly. Two searches were conducted in PubMed, Web of Science, Scopus, and PsycINFO. The first focused on studies that included at least all the traits of the Dark Triad or Dark Tetrad to ensure their assessment as originally conceptualized; the second on studies that assess at least one of the traits independently. 7 studies (8 effect sizes) and 13 studies (17 effect sizes), respectively, were included. Results showed positive associations of medium magnitude between narcissism, Machiavellianism, and psychopathy assessed with self-report and with observer-reports, indicating that they can be judged with some accuracy. Narcissism and psychopathy seem more easily observable, and the closer the observers are to the targets, the greater the accuracy. Machiavellianism seems less observable. This is the first meta-analysis of inter-rater agreement in assessing the Dark Triad and findings suggest that observer-reports could be a useful supplement to self-report to assessments.

Key words: Dark traits, Dark Tetrad, other-rating, peer-reports, informant-reports, indirect assessment.

Inter-rater agreement in personality assessment

A meta-analysis, focused on the quantitative assessment of the accuracy of observer-reports (i.e., informants, such as friends, family members, romantic partners, or even estrangers assessing the personality of targets) in personality assessment, reported correlations between self-reports and observer-reports, concluding that observer ratings are a good method for measuring personality since their ratings are clearly linked to the personality traits of the targets. It was felt that research could benefit from the use of this method of assessment (Connelly & Ones, 2010).

Other theoretical studies have supported the finding of similar results considering that self-perceptions contain relevant omissions so that assessment with both types of methods, i.e., self and observer-reports, could have benefits (Abernethy, 2015; Hofstee, 1994; McDonald, 2008; Vazire & Carlson, 2011). In addition, recent results have shown that approximately 40% of the variation in self-reports and single informant ratings can be attributed to methodological variation, suggesting that using multiple informants when assessing personality can be very useful (McCrae, 2018).

In this line, the SOKA model (Self–Other Knowledge Asymmetry Model; Vazire, 2010) emerged which states that the self is more accurate than others in assessing low observability (low visible and evaluative) traits, whereas others are more accurate than the self in assessing highly observable traits. Thus, showing that others' observations are especially accurate when it comes to socially desirable or undesirable (rather than neutral) traits such as agreeableness or openness to experience (Luan et al., 2019).

In this line, several recent empirical studies have provided data on the accuracy and on the predictive value of this assessment method for general personality models (Kholin et al., 2016; Luan et al., 2019; Müller & Moshagen, 2019). Specifically, these studies have provided data on significant relationships between self-reports and observer-reports when measuring the big six personality traits (HEXACO model; Ashton & Lee, 2007), as well as data on the predictive value of observer-reports (with an 18-year longitudinal study), especially for assessing some of these big traits (specifically, agreeableness, conscientiousness, and openness to experience).

As a conclusion on the benefits of using observer-reports in personality assessment, McDonald (2008) gave the following arguments: i) they offer a means of gathering objective information about a target; ii) they have the potential to be practical, cost-effective, and convenient, especially when administered online; iii) collecting data from multiple raters and aggregating it can enhance the reliability of the results; iv) insights into behavior can be gained from the perspectives of others, particularly across different situations; v) informant reports are free from socially desirable response bias.

The Dark Tetrad and its assessment

The Dark Tetrad is a set of four malevolent traits that, although distinct, are closely associated with each other (Chabrol et al., 2009; Jones & Paulhus, 2011; Paulhus & Williams, 2002): (1) Narcissism, characterized by egocentric self-admiration and feelings of grandiosity, which produce feelings of superiority and the need for ego reinforcement (Jones & Paulhus, 2014; Paulhus & Williams, 2002; Raskin & Hall, 1979); (2) Machiavellianism, determined by callous affect and manipulation, which is conducive to a strategic orientation focused on self-interest and personal gain (Christie & Geis, 1970; Jones & Paulhus, 2009, 2014; Paulhus & Williams, 2002); (3) Psychopathy, characterized by antisocial behavior, impulsivity, sensation seeking, and by low empathy and lack of remorse (Hare, 1970; Jones & Paulhus, 2014; Paulhus & Williams, 2002); (4) Sadism, represented by the feeling of enjoyment or sense of pleasure in observing or causing harm to others (Chabrol et al., 2009; O'Meara et al., 2011).

The assessment of malevolent, or undesirable, personality presents important biases in its measurement due to the greater likelihood of people who score high on these traits to present themselves in a social desirable way (Andrews & Meyer, 2003; Echeburúa et al., 2011; Spaans et al., 2017). In this sense, it appears that through self-reports we can identify malevolent traits in individuals who exhibit low social desirability. However, it is possible that the high social desirability of some subjects is biasing their responses to certain items, portraying a more positive self-image. Given the deceptive and manipulative nature of the Dark Traits, these findings suggest that these traits may be inaccurately measured in certain contexts (Galán et al., 2023). For this reason, and considering that one of the disadvantages of self-report is social desirability (Abernethy, 2015;

Althubaiti, 2016; McDonald, 2008), there are already many tests that have been designed in order to measure in a more indirect way the Dark Triad and the Dark Tetrad traits (i.e., different from self-reports in which people are directly asked about their personality) (Cattell & Warburton, 1967; Hernández-López et al., 1999; Lozano-Bleda et al., 2010; Ortner & Proyer, 2015; Rubio et al., 2004; Santacreu & Hernández, 2018). Observer-reports, in particular, could be considered an objective personality assessment method (McDonald, 2008).

In this sense, the assessment of malevolent personality could benefit from the use of observer-reports (Luan et al., 2019; Vazire, 2010; Kenny, 1988; Malesza & Kaczmarek, 2020; Muris et al., 2017). In line with the SOKA model, previously mentioned, this assessment method would be especially useful for measuring these traits given their undesirable nature (Vazire, 2010). In addition, different authors recommend incorporating multiple methods in personality assessment to achieve more reliable results (e.g., Kyllonen & Kell, 2018; McDonald, 2008; Ortner & Proyer, 2015).

However, few studies have included observer-reports in their assessment methodologies to measure the Dark Triad traits (e.g., Lämmle et al., 2021; Malesza & Kaczmarek, 2020; Vander Molen et al., 2018) and, more specifically, no study has been located that has included them to measure the Dark Tetrad. As for the assessment of these dark traits individually, we have not located many studies that have employed this assessment methodology either, even though they have concluded that they can be a good complement to self-reports (Carlson et al., 2011; Fowler & Lilienfeld, 2007; Miller et al., 2011).

Although considered as useful, the low frequency of the use of this assessment methodology may be due to the fact its use does not come without limitations. Some of these largely debated limitations are, first, the assessment procedure requires extra effort, since it involves obtaining data from third parties instead of asking the target directly, and, second, there is some personal information that informants may not be able to access (Baker et al., 2004; Malesza & Kaczmarek, 2020; McDonald, 2008).

Moreover, as is well known, self-report is the most widely used assessment method in psychology, despite some biases in its measurement, such as social desirability, as has already been mentioned (Althubaiti, 2016; Kyllonen & Kell, 2018). Specifically, to measure the traits of the Dark Triad and the Dark Tetrad, there are many self-report scales that have been validated for their measurement, the most widely used being the Dirty Dozen, the Short Dark Triad, and the Short Dark Tetrad, the Narcissistic Personality Inventory, the MACH-IV, the Self-Report Psychopathy Scale-III, or the Assessment of Sadistic Personality, among many others (Christie & Geis, 1970; Jonason & Webster, 2010; Jones & Paulhus, 2014; Muris et al., 2017; Paulhus et al., 2021; Plouffe et al., 2017; Raskin & Hall, 1979; Paulhus et al., 2009).

The present study

The present meta-analysis was formulated based (1) on the lack of studies on the accuracy of observer-reports, since the only meta-analysis located on this topic was published in 2010 and its scope was general personality traits (i.e., the Big Five; Goldberg, 1992) (Connelly & Ones, 2010); (2) on the interest in indirect assessment procedures for the Dark Triad and Dark Tetrad traits (Cattell & Warburton, 1967; Hernández-López et al., 1999; Lozano-Bleda et al., 2010; Ortner & Proyer, 2015; Rubio et al., 2004; Santacreu & Hernández, 2018); (3) and to clarify the debate on the accuracy of this assessment methodology for measuring these not socially desirable, malevolent traits (Baker et al., 2004; Malesza & Kaczmarek, 2020).

Therefore, the aim of the present study was to perform a meta-analysis on the accuracy of the observer-reports for assessing the Dark Triad and Dark Tetrad personality traits, providing a statistical value, and concluding whether this assessment method can be useful when indirectly measuring these malevolent traits. Thus, the present study aimed to analyze the relationships between these traits assessed with self-reports and assessed with observer-reports (inter-rater agreement), and to calculate effect sizes from the correlations between both types of assessment methodology for each of the dark traits.

To this end, two studies were carried out. The first meta-analysis focused on studies that included at least all three traits of the Dark Triad or all four traits of the Dark Tetrad to ensure their assessment as originally conceptualized; and the second on studies that assess at least one of the traits independently. It should be mentioned that the difference between them lies in one of the exclusion

criteria. In Study 1 it was considered appropriate to add as an exclusion criterion to eliminate studies that did not measure at least the three traits that form the Dark Triad (i.e., narcissism, Machiavellianism, and psychopathy) to include only studies that set out to assess the dark traits as they were originally conceived (Paulhus & Williams, 2002). However, after completing the screening phases of Study 1, many studies were discarded for this reason (in total, 514 studies). In addition, the total sample size of all included studies was not very large, which made it difficult to perform moderation analyses. Therefore, it was considered interesting to design a second version of the meta-analysis, eliminating this exclusion criterion and thus achieving a larger sample size that would allow the type of informant to be included as a moderating variable. Several studies have indicated that the accuracy of observer-reports will differ depending on how close the relationship between the target and the observer is, so it was of interest to include this moderating variable in the analyses (Connelly & Ones, 2010; Lämmle et al., 2021; Vazire, 2006; Vazire & Mehl, 2008).

Study 1
Method

Search Strategy and Study Selection

The systematic search was carried out in April 2021 in four databases: PubMed, Web of Science, Scopus, and PsycINFO. According to the objective, the search terms utilized were Dark Triad, Dark Tetrad, Dark traits, Narcissism, Machiavellianism, and Psychopathy, combined to create the following search string: ("Dark Triad" OR "Dark Tetrad" OR "Dark traits") OR ("Narcissism" AND "Machiavellianism" AND "Psychopathy"). The year 2002 was designated as the initial year because that was the year when the set of traits that form the Dark Triad was first presented (Paulhus & Williams, 2002). Prior to the meta-analysis, registration was made on X, the International prospective register of systematic reviews (registration number: X).

Inclusion and Exclusion Criteria

For this meta-analysis, only observer-reports used to assess Dark Triad or Dark Tetrad traits as initially conceived by Paulhus and Williams (2002) were of interest. Thus, those studies that divided the traits into subfactors (e.g., Machiavellianism in interpersonal tactics, cynical view of human nature, and disregard for conventional morality), that only reported a total Dark Triad or Dark Tetrad dark score (without reporting the score for each trait), or that did not measure at least three of the traits (forming at least the Dark Triad) were excluded.

However, as an exception, the splitting of trait narcissism into the vulnerability and grandiosity subfactors was not considered grounds for exclusion because, according to the authors of one of the most commonly used scales to assess the Dark Triad (i.e., the Short Dark Triad, Jones & Paulhus, 2014), the grandiosity subfactor represents the narcissism of the Dark Triad, so it might be a mistake to exclude studies that divided narcissism into vulnerability and grandiosity and not consider the latter. Therefore, unlike with the rest of the dark traits, if a study presented such a division, grandiose narcissism would be of interest for this meta-analysis.

To determine the eligibility of studies, specific criteria for inclusion were established as follows: (1) Non-duplicated studies; (2) studies written in Spanish or English; (3) studies related to the traits of interest (i.e., the Dark Triad or the Dark Tetrad); (4) any type of paper, as long as it is complete to read; (5) primary research only, excluding any narrative, systematic, meta-analytic reviews, or umbrella reviews; (6) studies measuring at least three of the four traits (narcissism, Machiavellianism, and psychopathy) that form the Dark Triad; (7) studies that divided the Dark Triad and Dark Tetrad into their traits, without presenting a single dark score (e.g., only a total Dark Tetrad); (8) studies that did not split all or some of the traits into subfactors (e.g., they offered the Machiavellianism trait but not its subfactors, i.e., interpersonal tactics, cynical view of human nature, and disregard for conventional morality); (9) studies that employed a self-report questionnaire/s to assess the Dark Triad or Dark Tetrad traits; (10) studies that used an observer-report to assess the Dark Triad or Dark Tetrad traits.

Screening Phases and Data Extraction

To facilitate the work of eliminating duplicates, all the studies that each of the databases (i.e., PubMed, Scopus, Web of Science, and PsycINFO databases) returned as a result of the search were downloaded into the Zotero reference manager (https://www.zotero.org/).

After eliminating the duplicates (*n* = 3315), the remaining studies were transferred to an Excel sheet to facilitate the next phases of the process, that is, the phases of study selection to eliminate all those that did not meet the inclusion criteria for meta-analysis. To do this, first, the titles and abstracts of each of the studies were read from the Excel sheet and those that did not meet the inclusion criteria were discarded. If the reviewers had doubts, the study was not discarded and was considered for the next phase. Secondly, each of the studies that was not discarded in the first screening was carefully read to consider whether it was definitively included because it met the established inclusion criteria. After both screening phases, a total of seven manuscripts were obtained (Figure 1).

Figure 1

Flowchart of the data collection (PRISMA Flow Diagram)
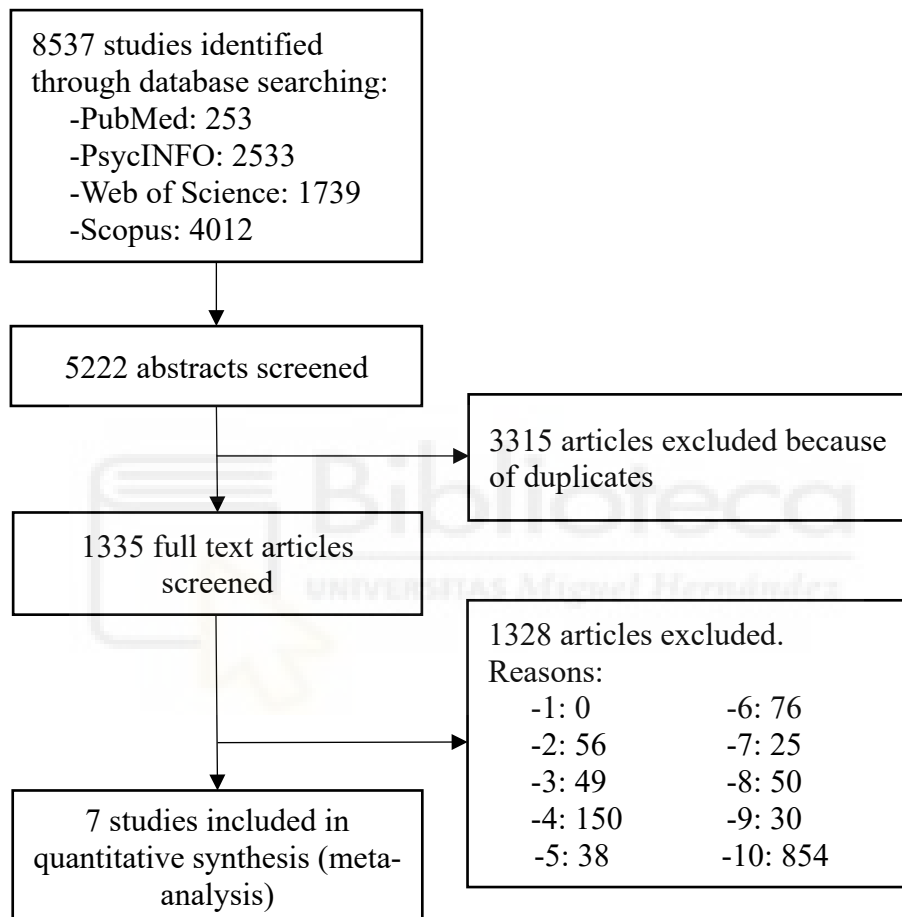
Note. Exclusion criteria: 1 = Duplicate; 2 = Language different from English or Spanish; 3 = Unrelated to the Dark Triad or Dark Tetrad; 4 = Full document not available; 5 = Not primary investigation; 6 = Do not measure at least three of the four traits; 7 = Reports a total Dark Triad or Dark Tetrad score, without dividing it into its traits; 8 = Divides all or some of the traits into subfactors without giving a total measure of each trait; 9 = No questionnaire is administered to assess the Dark Triad or Dark Tetrad traits; 10 = Does not use an observer-report to assess the Dark Triad or Dark Tetrad traits.

In each of these two phases, two independent reviewers first examined the same studies (10% of all studies) to determine and ensure inter-reviewer agreement. Second, each of the reviewers examined half of the remaining articles (i.e., 50%) with the collaboration of trained undergraduate students (mentioned in Acknowledgments).

Once the studies that met the inclusion criteria for the meta-analysis were obtained, the data of interest were extracted (variable coding phase) in an Excel spreadsheet that would later result in Table 1. To avoid coding problems and possible discordance between reviewers, a Coding Manual was prepared detailing the procedure for coding each variable. The data extracted from each study

were as follows: (1) Authors and year of publication of the study; (2) Information on the study sample, i.e., the participants: country, sample size, age (mean and standard deviation), gender proportion, and type of sample; (3) Information on the questionnaires of interest used: self-report used to measure the Dark Triad or Dark Tetrad traits and its reliability index (namely, Cronbach's Alpha), and observer-report used to measure the Dark Triad or Dark Tetrad traits, together with its reliability index (again, Cronbach's Alpha) and the informant (i.e., the persons completing the questionnaire); (4) Results obtained: correlation value between the Dark Triad or Dark Tetrad traits measured with the self-report and the observer-report.

To ensure correct data extraction in this last phase, two reviewers independently coded the variables of one of the seven manuscripts, and a correlational analysis was performed to obtain an inter-rater reliability value. Maximum agreement between the two raters was obtained: $r = 1$, $p <$ .001. Next, one of the previous reviewers coded the variables of the rest of the studies, that is, the remaining six studies, and, in case of doubts with any variable of any study, the rest of the reviewers of the paper were informed to make a consensual decision. If any of the data of interest were not reported in the study, the primary reviewer of the study contacted the corresponding author to request the data. All the steps are depicted in Figure 1, which illustrates the PRISMA flow (Moher et al., 2010).

Quality Assessment

The methodological quality of the studies was assessed using the STROBE list (Strengthening the Reporting of Observational Studies in Epidemiology; Elm et al., 2007; Vandenbroucke et al., 2007), composed of 34 checklist criteria referring to the content that a published study should have. For the cross-sectional studies (those included in this meta-analysis), the list consisted of a total of 32 criteria, scored 1 when the guideline was included in its entirety in the study, .50 when it was partially included (incomplete or not very specific), and 0 when it was not included.

These points made it possible to obtain a total quality score for the seven studies, and each study could be classified in three different ways: excellent quality when the score was equal to or greater than 85 (as a result of adding the scores assigned to each item, multiplying them by 100 and dividing by the maximum score that could be obtained, considering that in some cases "NA" could be assigned if the item did not apply to the study), good quality when the score was between 70 and 85, fair quality when the score was between 50 and 70, and poor quality when the score was less than 50.

To ensure reliability in quality assessment, again, two independent reviewers analyzed one of the seven studies and then one reviewer analyzed the rest of the studies. To obtain an index of inter-rater reliability, a correlational analysis was performed, which indicated good agreement: $r =$ .75, $p <$ .001.

Statistical analysis

To estimate the magnitude of the relationships between the study variables, i.e., between the Dark Tetrad traits assessed by self-report and observer-report, effect sizes were calculated from the correlations (Pearson's r) provided in the studies included in the meta-analysis. To interpret the magnitudes of the correlations, the criteria established by Cohen (1992) were used as a reference: a value of $r = .10$ or close to it would indicate a small magnitude, a value of $r = .30$ or close to it would indicate a medium magnitude, and a value of $r = .50$ or higher would indicate a large magnitude.

One of the studies (Lämmle et al., 2021) provided three correlations between self-report and observer-report for each trait, so, in order to obtain a single correlational value and not bias the results (to avoid duplicating the sample), the r values were transformed to Fisher's Z, averaged to obtain a single value, and transformed back to r values (Sánchez-Bruno & Borges del Rosal, 2005).

The analysis was carried out using Fisher's r to z transformed correlation coefficient as the outcome measure, and the data were analyzed using a random effects model. The Restricted Maximum Likelihood Estimator (REML; Viechtbauer, 2010) was utilized to estimate the amount of heterogeneity (i.e., τ^2) in the data. Furthermore, we assessed heterogeneity using the Q-test (Cochran, 1954) and calculated the Higgins test (I^2) as well as 95% prediction intervals for the observed results.

Finally, publication biases were examined using the Begg and Mazumdar rank correlation test (1994). This test calculates a correlation coefficient between the effect size and its variance in a

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funnel plot, and a significant correlation (*p*-value < .05) suggests the presence of publication bias. However, this test may be underpowered to detect bias when the number of studies is small. Therefore, the Egger's regression test (1997) was also employed to increase sensitivity in detecting bias. This test examines the relationship between the effect size and its precision (standard error) in a funnel plot as well by performing a linear regression analysis. Likewise, a significant intercept (*p*-value < .05) suggests the presence of publication bias. All statistical analyses were performed using the Jamovi (version 2.2.5) statistical program.

Results

Selection and Inclusion of Studies

Figure 1 shows the process of searching, screening, and exclusion of studies to obtain the final number of studies included in the meta-analysis (N = 7 with 8 effect sizes). Thus, a total of 8537 studies were obtained after adding the search equation in the different databases. Of these, 3315 were eliminated as duplicates, resulting in a total of 5222 studies to be screened. In the first screening, most of them were excluded because they were not related to the topic of interest (i.e., they included, for example, the terms "triad" "tetrad" or "dark" but did not refer to the Dark Triad or Dark Tetrad). It was not possible to discard any studies with exclusion reason 10 (i.e., "does not use an observer-report to assess the Dark Triad or Dark Tetrad traits") as it was not possible to know for most studies whether they were including peer review, so this reason turned out to be unique to the second screening. In the second screening, 854 studies were excluded mainly for not employing observer-reports to complement the self-report assessment of traits.

Initially it was concluded that nine studies would meet the inclusion criteria, but during the data extraction phase it was noted that two of the nine studies had to be discarded because, although they did employ observer-reports, the study samples were derived from another study. That is, from the same sample, three different studies were published, and, in each study, different data were reported (reporting the correlations divided by sex or not reporting the correlations of interest). Therefore, in order not to duplicate the sample and bias the results, the two studies that did not report the values of interest were discarded and the one that did was included (Holtzman, 2011; Holtzman & Strube, 2013b, 2013a).

Quality Assessment of Studies

The evaluation of the methodological quality of the selected studies was evaluated, revealing that no study was rated excellent, but neither was it rated poor, two studies were rated as good, and five studies were deemed fair. Most of the studies were incomplete in providing comprehensive information on their research methodology, specifically with regards to details on the sampling strategy and statistical approaches. However, there was no moderation effect attending to the quality of the studies in the values of interest.

Characteristics of the Included Studies

General information

Table 1 presents the characteristics of the seven papers that met the established inclusion criteria. However, although seven papers were included, one of them reported two samples (parents and friends as independent informants), so they were considered as two independent studies when performing the analyses (Lämmle et al., 2021). As a result, seven studies with eight effect sizes were included for the analysis of the accuracy of the self-reports.

The papers were published between 2013 and 2021, with 2013 being the year in which two studies employed this assessment methodology. None of the included studies assessed the Dark Tetrad, i.e., none of the studies included the assessment of sadism. Thus, all seven studies assessed narcissism, Machiavellianism, and psychopathy (the Dark Triad), so the results presented in this section correspond to this set of three traits.

Description of the sample

The total study sample (i.e., the total number of participants who were evaluated by both self-report and observer-report in all the included studies) was 2023 (mean sample size = 252.88; range = 65-798). As for their characteristics, the mean age across samples was 19.86, and the mean proportion of women was 62.39%. Most of the participants were Germans (*n* = 1367; 67.57%) and students (*n* = 1389; 68.66%).

Table 1

Information about the articles included in the analyses

Study	Sample					Instruments			Results (*r*)				S. score
	Country	Size (*N*)	Sample age (*M*; *SD*)	Gender proportion (female)	Sample type	Self-report (α)	Observer-report (α)	Informant	P	N	M	S	
Holtzman and Strube (2013b)	United States	151	19.40; 1.22	56%	Students	SRP-III (.92); NPI-40 (.85); Mach-IV (.81)	*Ad hoc* (.39); *Ad hoc* (.78); *Ad hoc* (-.04)	Friends, acquaintance from college, hometown or high school, current and ex-intimate partner	.33	.48	.26	NI	71.43
Muris et al. (2013)	Netherlands	117	13.90; 0.96	56.41%	Students	DD-Y (.67); DD-Y (.66); DD-Y (.70);	DD-Y (.71); DD-Y (.74); DD-Y (.76);	Parents	.23	.15	.32	NI	58.93
Jones and Paulhus (2014)	United States and Canada	65	20.10; NI	60%	Mturk	SD3 (.80); SD3 (.71); SD3 (.77)	SD3 (.86); SD3 (.67); SD3 (.62)	Friends, family, romantic partners	.57	.34	.42	NI	62.50
Miller et al. (2017)	NI	178	19.30; 2.20	63.92%	Students	SRP-III (.93); NPI (.82); Mach-IV (.81)	SD3 + DD (NI); SD3 + DD (NI); SD3 + DD (NI);	NI	.29	.17	.33	NI	51.97
Vander Molen et al. (2018)	United States	145	20.37; 2.88	82.75%	Students	SD3 + Brief DT (.80); SD3 + Brief DT (.76); SD3 + Brief DT (.80);	Brief DT (.68); Brief DT (.82); Brief DT (.75);	Other people on Facebook	.09	.18	.12	NI	64.29
Malesza and Kaczmarek (2020)	Germany	798	22.90; 1.30	68%	Students	SRP-III (.79); NPI-17 (.77); Mach-IV (.83)	SRP-III (.98); NPI-17 (.93); Mach-IV (.97)	Acquaintance, roommate, or significant other	.46	.33	.49	NI	64.29
Lämmle et al. (2021)	Germany	279	21.44; 1.81	56%	General population	SRP-III (.73-.77); NPI (.77-.85); Mach-IV (.43-.55)	SRP-III (.76-.79); NPI (.75-.81); Mach-IV (.44-.69)	Parents	.43*	.63*	.26*	NI	80.36

Study	Sample					Instruments			Results (*r*)				S. score
	Country	Size (*N*)	Sample age (*M*; *SD*)	Gender proportion (female)	Sample type	Self-report (α)	Observer-report (α)	Informant	P	N	M	S	
	Germany	290	21.44; 1.81	56%	General population	SRP-III (.73-.77); NPI (.77-.85); Mach-IV (.43-.55)	SRP-III (.80-.84); NPI (.84-.86); Mach-IV (.45-.63)	Friends	.53*	.70*	.28*	NI	

Note. P = Psychopathy; N = Narcissism; M = Machiavellianism; S = Sadism; NI = Not indicated; S. score = STROBE score; α = Cronbach's alpha; *r* = Pearson's correlation; Mturk = Amazon's Mechanical Turk; SD3 = Short Dark Triad; DD = Dirty Dozen; DD-Y = Dirty Dozen for Youths; SRP-III = Self-Report Psychopathy Scale–III version; NPI = Narcissistic Personality Inventory; Brief DT = Brief Dark Triad Scale; *By Fisher Z-transformation.

Description of self-reports and observer-reports scales

Regarding the instruments used to assess the Dark Triad and Dark Tetrad traits, both self-reports and observer-reports have been reported. As for self-reports, specifically, six different types of scales were used (some of which have been versioned), including the Self-Report Psychopathy Scale (SRP; Paulhus et al., in press), the Narcissistic Personality Inventory (NPI; Raskin & Hall, 1979), the Machiavellianism Scale (Mach-IV; Christie & Geis, 1970), the Short Dark Triad (SD3; Jones & Paulhus, 2014), the Dirty Dozen (DD; Jonason & Webster, 2010), and a combination of the SD3 and a brief Dark Triad measure. The internal consistency estimates (Cronbach's alpha – α) for these instruments ranged from .43 to .93. As for observer-reports, the same scales were used in each study, modifying the items to third person, although two of the studies used different scales: one of them designed their own items (*ad hoc* scale), and the other combined the SD3 with the DD. In this case, the internal consistency estimates ranged from -.04 to .98.

When selecting informants (i.e., participants who would fill out the dark trait scales with the targets in mind) in the studies, they included family members, friends, acquaintances from high school, college, or hometown, roommates, or ex-partners or current romantic partners. However, one of the studies selected informants not known to the targets, i.e., selected other people from Facebook. One of the studies did not report the type of informants.

Accuracy of observer-reports: Effect sizes
Accuracy of observer-report to assess narcissism

For the Narcissism assessed with self-report and assessed with observer-report, the random-model ($k = 8$) showed a positive correlation of medium magnitude ($r = .42$, 95% CI [0.23, 0.61], $z = 4.31$, $p < .001$), with positive relationship between narcissism assessed with both methodologies self-report and assessed with observer-report. The Q test and I^2 statistics indicated significant heterogeneity between samples (Q (7) = 117.85, $p < .001$, $I^2 = 93.97$) and τ^2 was 0.070 (95% CR [-0.13, 0.97]). The forest plot of the results is shown in Figure 2.

Figure 2

Forest plot of the relationship between narcissism assessed with self-report and assessed with observer-report
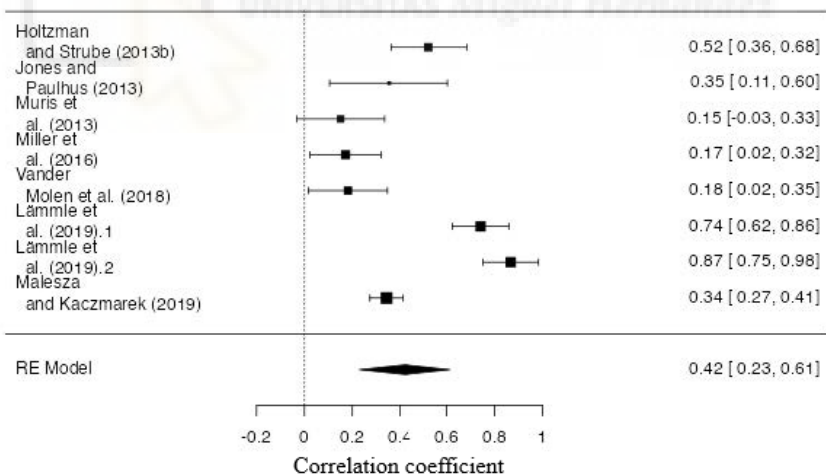
Accuracy of observer-report to assess Machiavellianism

The random-effects model ($k = 8$) of the Machiavellianism assessed with self-report and assessed with observer-report yielded a positive medium magnitude correlation ($r = .33$, 95% CI [0.23, 0.42], $z = 6.79$, $p < .001$), with positive relationship between this trait assessed with self-report and assessed with observer-report. The Q test and I^2 statistics indicated significant heterogeneity between samples (Q (7) = 37.65, $p < .001$, $I^2 = 74.16$) and τ^2 was 0.013 (95% CR [0.09, 0.57]). The forest plot is presented in Figure 3.

Accuracy of observer-report to assess psychopathy

Finally, in the random-effects model ($k = 8$) of the psychopathy assessed with self-report and assessed with observer-report, a correlation of medium and positive magnitude was also obtained ($r = .40$, 95% CI [0.27, 0.52], $z = 6.25$, $p < .001$), with positive relationship between this trait assessed

with both methodologies self-report and assessed with observer-report. The Q test and I^2 statistics indicated significant heterogeneity between samples (Q (7) = 38.94, $p < .001$, $I^2 = 85.21$) and τ^2 was 0.026 (95% CR [0.06, 0.73]). The forest plot is presented in Figure 4.

Figure 3

Forest plot of the relationship between Machiavellianism assessed with self-report and assessed with observer-report
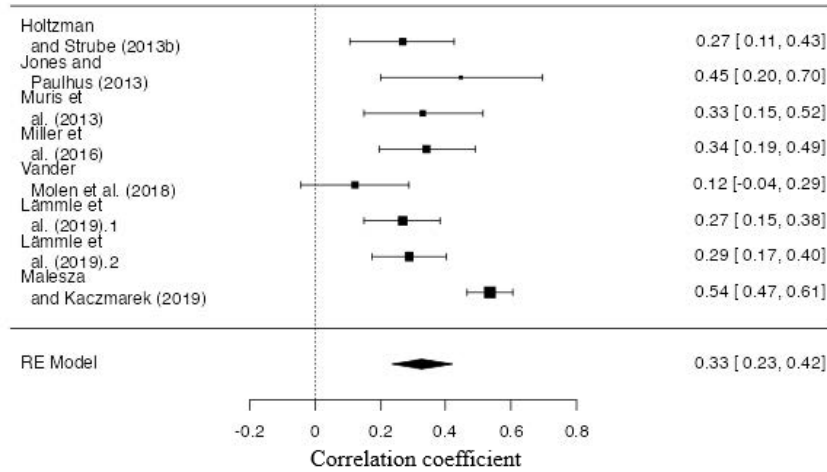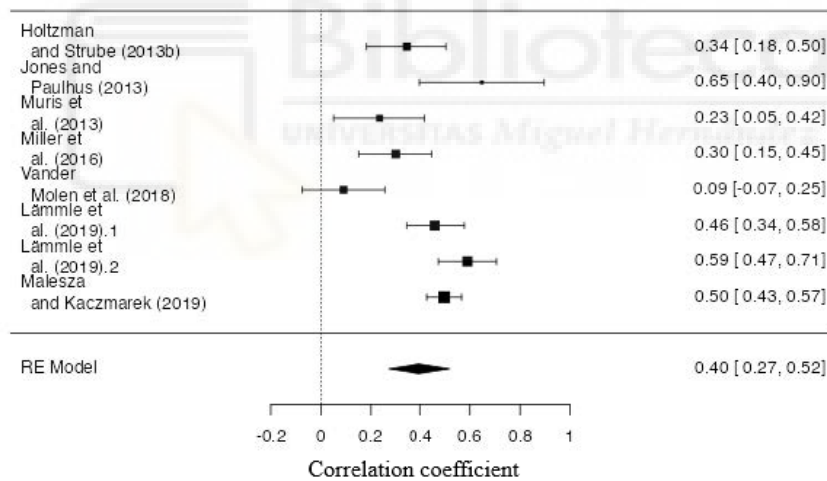

Figure 4

Forest plot of the relationship between psychopathy assessed with self-report and assessed with observer-report

Publication bias assessment

Possible publication bias was examined using Begg and Mazumdar's rank correlation and Egger's regression test. On the one hand, the Begg and Mazumdar rank correlation test yielded the following results: for narcissism, a correlation coefficient of 0, with a *p*-value of 1; for Machiavellianism, a correlation of 0, with a *p*-value = 1; and for psychopathy, with a value of *p* = .18, a correlation of -.43. On the other hand, the Egger's regression test showed the following results: for narcissism, a regression coefficient of -.94, with a value of *p* of .35; for Machiavellianism, a coefficient of -.82, with a *p*-value = .41; and for psychopathy, with a *p*-value = .72, a coefficient of -.36. These values indicate that there is no evidence of publication bias for any of the cases analyzed.

Study 2
Method

Search Strategy and Study Selection

The search strategy was the same as in Study 1 (see Study 1 for details).

Inclusion and Exclusion Criteria

For this second version of the meta-analysis, the inclusion and exclusion criteria were also the same as in Study 1, except for criterion number 6 (it excluded studies that did not measure at least the three traits of the Dark Triad). Therefore, to determine the eligibility of studies, the following specific inclusion criteria were established: (1) Non-duplicated studies; (2) studies written in Spanish or English; (3) studies related to the traits of interest (i.e., the Dark Triad or the Dark Tetrad); (4) any type of paper, as long as it is complete to read; (5) primary research only, excluding any narrative, systematic, meta-analytic reviews, or umbrella reviews; (6) studies that divided the Dark Triad and Dark Tetrad into their traits, without presenting a single dark score (e.g., only a total Dark Tetrad); (7) studies that did not split all or some of the traits into subfactors (e.g., they offered the Machiavellianism trait but not its subfactors, i.e., interpersonal tactics, cynical view of human nature, and disregard for conventional morality); (8) studies that employed a self-report questionnaire/s to assess the Dark Triad or Dark Tetrad traits; (9) studies that used an observer-report measure to assess the Dark Triad or Dark Tetrad traits.

Screening Phases and Data Extraction

The screening and data extraction phases were also the same as in Study 1. However, since in this second version one of the inclusion criteria (criterion 6 of the first version) was removed, the two screening phases were repeated to review all those studies that had been excluded from the meta-analysis with exclusion reason 6 of Study 1. If the reviewers had doubts, the study was not discarded and was considered for the next phase. Each of the studies that were not discarded in the first screening were then read carefully to consider whether they were included because they met the inclusion criteria. This resulted in a total of 13 studies, i.e., 6 more than in Study 1 (with 9 more effect sizes) (Figure 5).

Quality Assessment

The assessment of the methodological quality of the studies was also the same as in Study 1 (Strengthening the Reporting of Observational Studies in Epidemiology; Elm et al., 2007; Vandenbroucke et al., 2007). However, since more studies met the inclusion criteria, the methodological quality of these new studies had to be assessed.

Statistical analysis

The statistical analyses were also the same as those carried out in Study 1. However, in addition to calculating effect sizes as was done in Study 1, in this second study, moderating variables were included in the analysis to analyze their possible moderating role in the relationship between traits assessed by self-report and observer-report. Specifically, the type of informant was included which was recoded as 0 (when the informant was someone known, such as family, friends, or romantic partners) and 1 (when the informant was someone unknown).

<div align="center">

Results

</div>

Selection and Inclusion of Studies

Figure 5 shows the process of searching, screening, and exclusion of studies to obtain the final number of studies included in this second version of the meta-analysis ($N = 13$ with 17 effect sizes). Since Study 2 differed from Study 1 only in one inclusion criterion (number 6 of Study 1), the first results were the same as in Study 1, i.e., a total of 8537 studies were obtained from the different databases, 3315 were eliminated as duplicates, and a total of 5222 studies were screened.

As in the first study, in the first screening most studies were excluded because they were not related to the topic of interest (i.e., they included, for example, the terms "triad", "tetrad" or "dark", but did not refer to the Dark Triad or the Dark Tetrad). Also, in the second screening, most were excluded because they did not use observer-report as a complementary measure to self-reported trait assessment ($n = 1362$).

Quality Assessment of Studies

The evaluation of the methodological revealed that no study was rated excellent, but neither was it rated poor, four studies were rated as good, and nine studies were deemed fair. Most of the studies were incomplete in providing comprehensive information on their research methodology, specifically with regards to details on the sampling strategy and statistical approaches. However, there was no moderation effect attending to the quality of the studies in the values of interest.

Characteristics of the Included Studies

General information

Table 2 presents the characteristics of the 13 papers that met the established inclusion criteria. Four of them reported two samples because they split the analysis between independent informants or between men and women, or because they used more than one observer-reporting instrument, so they were considered as independent studies when performing the analyses (He et al., 2018; Lämmle et al., 2021; Maaß & Ziegler, 2017; Weiss et al., 2018). As a result, 13 studies with 17 effect sizes were included for the analysis of the accuracy of the observer-reports. However, there were studies that only measured one of the three traits, so the effect sizes were different depending on which trait was measured.

Figure 5

Flowchart of the data collection (PRISMA Flow Diagram)
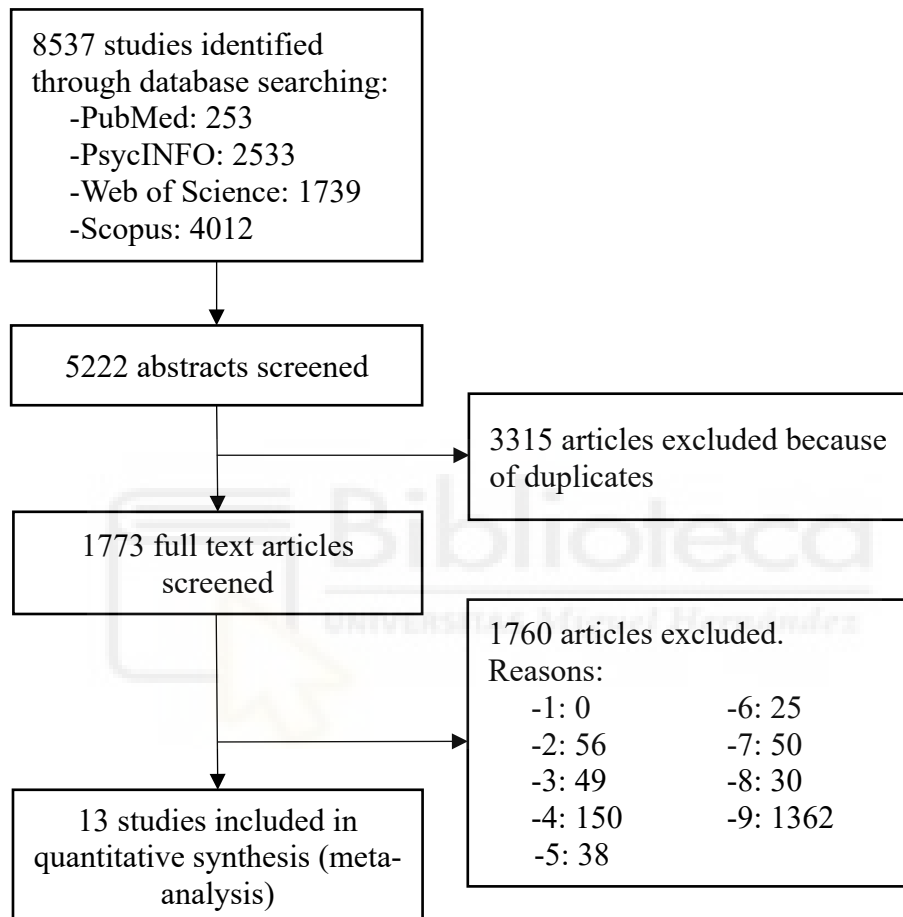
Note. Exclusion criteria: 1 = Duplicate; 2 = Language different from English or Spanish; 3 = Unrelated to the Dark Triad or Dark Tetrad; 4 = Full document not available; 5 = Not primary investigation; 6 = Reports a total Dark Triad or Dark Tetrad score, without dividing it into its traits; 7 = Divides all or some of the traits into subfactors without giving a total measure of each trait; 8 = No questionnaire is administered to assess the Dark Triad or Dark Tetrad traits; 9 = Does not use an observer-report to assess the Dark Triad or Dark Tetrad traits.

The papers were published between 2013 and 2021, with 2013 being the year in which the most studies used this assessment methodology. None of the included studies assessed the Dark Tetrad, i.e., none of the studies included the assessment of sadism. As in the Study 1, all 13 studies assessed narcissism, Machiavellianism, and psychopathy (the Dark Triad), so the results presented in this section correspond to this set of three traits.

Description of the sample

The total study sample was 4502 (mean sample size = 264.82; range = 62-798). Regarding their characteristics, the mean age across samples was 24.54, and the mean proportion of women was 58.01%. Most of the participants were Germans (*n* = 2332; 51.80%) and general population (*n* = 2398; 53.27%).

Table 2

Information about the articles included in the analyses

Study	Sample					Instruments			Results (*r*)				S. score
	Country	Size (*N*)	Sample age (*M*; *SD*)	Gender proportion (female)	Sample type	Self-report (α)	Observer-report (α)	Informant	P	N	M	S	
Holtzman and Strube (2013b)	United States	151	19.40; 1.22	56%	Students	SRP-III (.92); NPI-40 (.85); Mach-IV (.81)	*Ad hoc* (.39); *Ad hoc* (.78); *Ad hoc* (-.04)	Friends, acquaintance from college, hometown or high school, current and ex-intimate partner	.33	.48	.26	NI	71.43
Muris et al. (2013)	Netherlands	117	13.90; 0.96	56.41%	Students	DD-Y (.67); DD-Y (.66); DD-Y (.70);	DD-Y (.71); DD-Y (.74); DD-Y (.76);	Parents	.23	.15	.32	NI	58.93
Jones and Paulhus (2014)	United States and Canada	65	20.10; NI	60%	Mturk	SD3 (.80); SD3 (.71); SD3 (.77)	SD3 (.86); SD3 (.67); SD3 (.62)	Friends, family, romantic partners	.57	.34	.42	NI	62.50
Nealis et al. (2016)	NI	588	20.70; 3	76.77%	Students	DD (.78)	DD (.89)	Friends, family, romantic partners, other	—	.38	—	—	80.36
Maaß and Ziegler (2017)	Germany	219	37.52; 16.93	64.38%	General population	SD3 (.70)	NPI-16 (NI)	Trained research assistants	—	.32	—	—	64.29
	Germany	219	37.52; 16.93	64.38%	General population	SD3 (.70)	Communal Narcissism Inventory (NI)	Trained research assistants	—	-.05	—	—	
Miller et al. (2017)	NI	178	19.30; 2.20	63.92%	Students	SRP-III (.93); NPI (.82); Mach-IV (.81)	SD3 + DD (NI); SD3 + DD (NI); SD3 + DD (NI);	NI	.29	.17	.33	NI	51.97
He et al. (2018)	China	260	28.28; 3.84	100%	General population	LSRP (NI); Mach-IV (NI)	LSRP (NI); Mach-IV (NI)	Romantic partners	.36	—	.34	—	62.50
	China	260	26.61; 3.96	0%	General population	LSRP (NI); Mach-IV (NI)	LSRP (NI); Mach-IV (NI)	Romantic partners	.41	—	.26	—	

Study	Sample					Instruments							S. score
	Country	Size (*N*)	Sample age (*M*; *SD*)	Gender proportion (female)	Sample type	Self-report (α)	Observer-report (α)	Informant	P	N	M	S	
Klipfel and Kosson (2018)	NI	62	26.40; 6.70	0%	Inmates	NPI (.85)	IM-N (.94)	Trained research assistants	——	.29	——	——	71.43
Vander Molen et al. (2018)	United States	145	20.37; 2.88	82.75%	Students	SD3 + Brief DT (.80); SD3 + Brief DT (.76); SD3 + Brief DT (.80);	Brief DT (.68); Brief DT (.82); Brief DT (.75);	Other people on Facebook	.09	.18	.12	NI	64.29
Weiss et al. (2018)	United States	172	26; 3.40	100%	General population	NEO-FFI *ad hoc* version (.73)	NEO-FFI *ad hoc* version (.75)	Romantic partners	.41	——	——	——	62.50
	United States	172	27.60; 3.90	0%	General population	NEO-FFI *ad hoc* version (.70)	NEO-FFI *ad hoc* version (.79)	Romantic partners	.46	——	——	——	
Heinze et al. (2020)	Germany	527	27.68; 9.84	81.48%	General population	NPI	NPI	Friends, family	——	.57	——	——	66.07
Malesza and Kaczmarek (2020)	Germany	798	22.90; 1.30	68%	Students	SRP-III (.79); NPI-17 (.77); Mach-IV (.83)	SRP-III (.98); NPI-17 (.93); Mach-IV (.97)	Acquaintance, roommate, or significant other	.46	.33	.49	NI	64.29
Lämmle et al. (2021)	Germany	279	21.44; 1.81	56%	General population	SRP-III (.73-.77); NPI (.77-.85); Mach-IV (.43-.55)	SRP-III (.76-.79); NPI (.75-.81); Mach-IV (.44-.69)	Parents	.43*	.63*	.26*	NI	80.36
	Germany	290	21.44; 1.81	56%	General population	SRP-III (.73-.77); NPI (.77-.85); Mach-IV (.43-.55)	SRP-III (.80-.84); NPI (.84-.86); Mach-IV (.45-.63)	Friends	.53*	.70*	.28*	NI	

Note. P = Psychopathy; N = Narcissism; M = Machiavellianism; S = Sadism; NI = Not indicated; S. score = STROBE score; α = Cronbach's alpha; *r* = Pearson's correlation; Mturk = Amazon's Mechanical Turk; SD3 = Short Dark Triad; DD = Dirty Dozen; DD-Y = Dirty Dozen for Youths; SRP-III = Self-

Report Psychopathy Scale–III version; LSRP = Levenson Self-Report Psychopathy Scale; NPI = Narcissistic Personality Inventory; IM-N = Interpersonal Measure of Narcissism; Brief DT = Brief Dark Triad Scale; NEO-FFI = NEO Five-Factor Inventory; *By Fisher Z-transformation.

Description of self-reports and observer-reports scales

Regarding self-reports, a total of eight distinct types of scales were utilized, with some of them having undergone modifications. These scales were the same as those cited in Study 1 (see for more details) plus the Levenson Self-Report Psychopathy Scale (LSRP; Levenson et al., 1995) and an *ad hoc* version of the NEO Five-Factor Inventory (NEO-FFI; Costa & McCrae, 1992). The α for these measurement instruments ranged from .43 to .93. As for observer-reports, the same scales were employed in each study, but adapted to third-person perspective. However, four of them used different scales: *ad hoc* scale, a combination of the SD3 and DD, the NPI and the Communal Narcissism Inventory, and the Interpersonal Measure of Narcissism (IM-N; an unpublished measure). In this case, the α ranged from -.04 to .98.

The informants were the same as in Study 1, i.e., family members, friends, acquaintances from high school, university or hometown, roommates or former or current romantic partners, and other people on Facebook. In addition to these, in this second study two of the papers included trained research assistants as informants.

Accuracy of observer-reports and the moderating role of the type of informant: Effect sizes

Accuracy of observer-report to assess narcissism

The random-model ($k = 13$) showed a positive correlation of medium magnitude ($r = .39$, 95% CI [0.24, 0.53], $z = 5.30$, $p < .001$), with positive relationship between narcissism assessed with both methodologies. The Q test and I^2 statistics indicated significant heterogeneity between samples ($Q (12) = 196.81$, $p < .001$, $I^2 = 94.31$) and τ^2 was 0.063 (95% CR [-0.13, 0.90]). The forest plot of the results is shown in Figure 6.

Figure 6

Forest plot of the relationship between narcissism assessed with self-report and assessed with observer-report
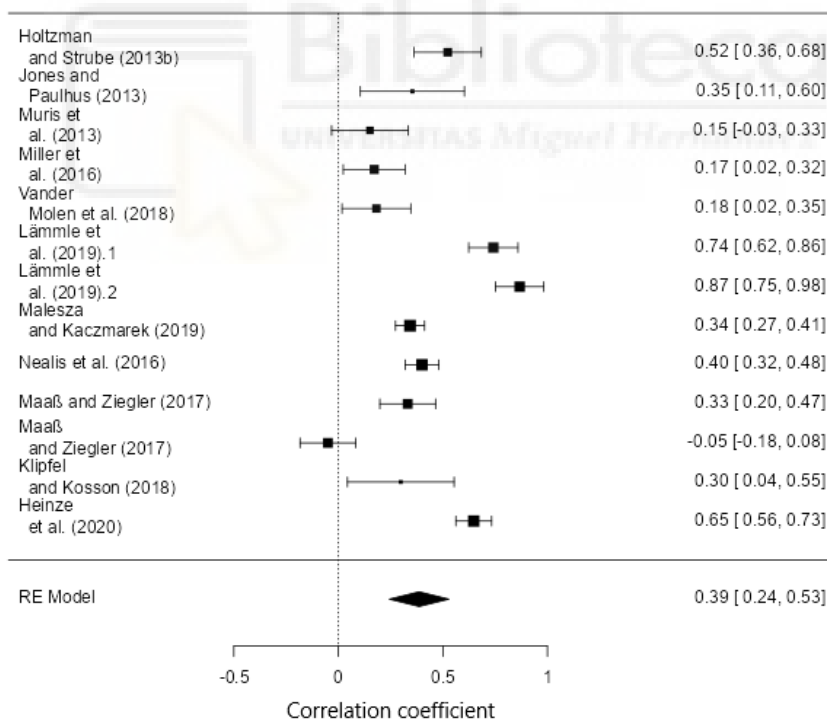
When informant type was included in the analysis, the random-model ($k = 12$) yielded a negative correlation of medium magnitude ($r = -.33$, 95% CI [-0.60, -0.06], $p < .05$), indicating that the informant type is a significant moderator of the relationship between the two assessment methodologies and that this relationship will be stronger when the informant is someone known to the informant.

Accuracy of observer-report to assess Machiavellianism

The random-effects model ($k = 10$) yielded a positive medium magnitude correlation ($r = .33$, 95% CI [0.25, 0.40], $z = 8.35$, $p < .001$), with positive relationship between this trait assessed with self-report and assessed with observer-report. The Q test and I^2 statistics indicated significant heterogeneity between samples (Q (9) = 40.77, $p < .001$, $I^2 = 69.85$) and τ^2 was 0.010 (95% CR [0.12, 0.53]). The forest plot is presented in Figure 7.

Figure 7

Forest plot of the relationship between Machiavellianism assessed with self-report and assessed with observer-report
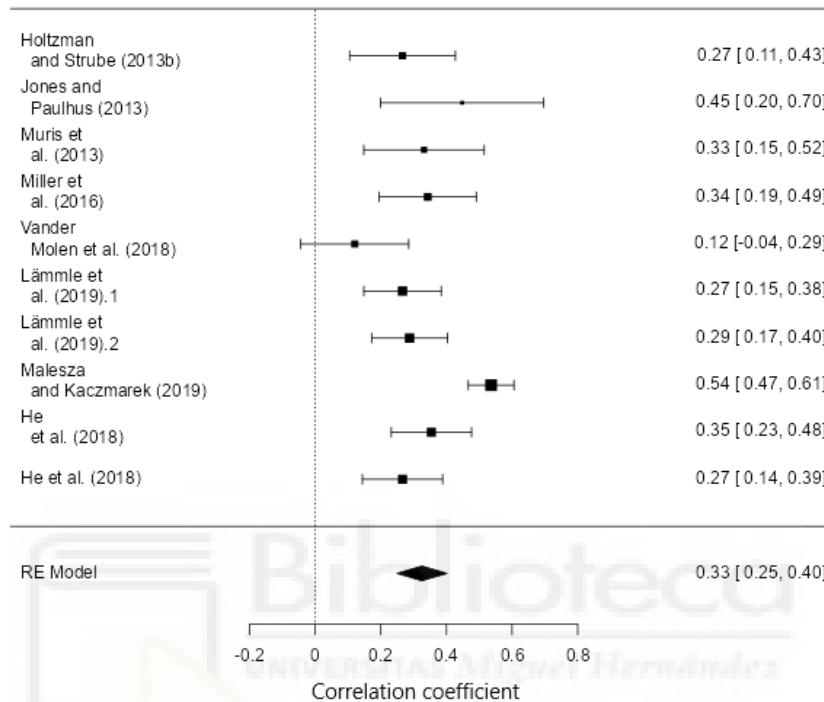
In this case, the random-model ($k = 9$) yielded a no significant correlation ($r = -.23$, 95% CI [-0.49, 0.03], $p > .05$) when informant type was included in the analysis. Results showed that the informant type was not associated with a detectable difference in effect size.

Accuracy of observer-report to assess psychopathy

Finally, in the random-effects model ($k = 12$) a correlation of medium and positive magnitude was also obtained ($r = .41$, 95% CI [0.33, 0.49], $z = 10.10$, $p < .001$), with positive relationship between this trait assessed with both methodologies self-report and assessed with observer-report. The Q test and I^2 statistics indicated significant heterogeneity between samples (Q (11) = 40.48, $p < .001$, $I^2 = 76.19$) and τ^2 was 0.014 (95% CR [0.16, 0.66]). The forest plot is presented in Figure 8.

The random-model ($k = 11$) yielded a negative correlation of medium magnitude ($r = -.36$, 95% CI [-0.58, -0.15], $p < .001$) when informant type was included in the analysis. These results showed that the informant type is a significant moderator of the relationship between the two assessment methodologies and that this relationship will be stronger when the informant is someone known to the informant.

Publication bias assessment

The Begg and Mazumdar rank correlation test showed the following results: for narcissism, a correlation coefficient of -0.14, with a p-value of 0.50; for Machiavellianism, a correlation of 0, with a p-value = 1; and for psychopathy, with a value of $p = .05$, a correlation of -.43. The Egger's regression test showed the following results: for narcissism, a regression coefficient of -1.09, with a value of p of .28; for Machiavellianism, a coefficient of -1.02, with a p-value = .31; and for psychopathy, with a p-value = .54, a coefficient of -.61. These values indicate that there is no evidence of publication bias for any of the cases analyzed, although in the case of psychopathy the significance level is just .05, which could indicate some bias.

Figure 8

Forest plot of the relationship between psychopathy assessed with self-report and assessed with observer-report
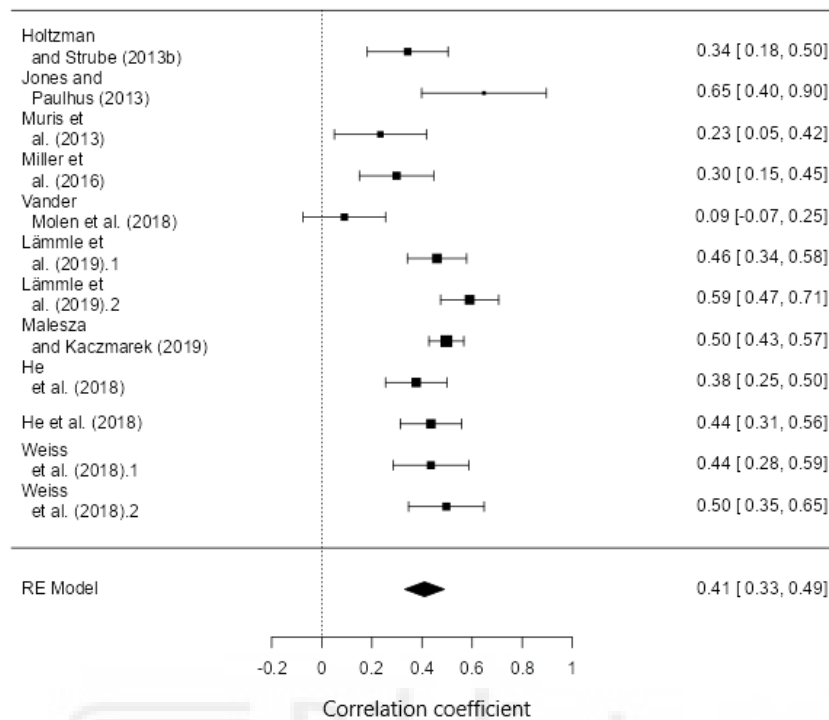
Discussion

The purpose of this study was motivated by several factors. First, a lack of research on the accuracy of observer-reported measures of personality traits was detected, as only one meta-analysis published in 2010 by Connelly and Ones was located, which, moreover, referred only to the Big Five traits (Goldberg, 1992). Secondly, a growing interest was detected in the indirect assessment of personality traits and, more specifically, of those traits with a higher probability of being presented as socially more desirable (such as the Dark Triad and the Dark Tetrad; Andrews & Meyer, 2003; Echeburúa et al., 2011; Spaans et al., 2017), as shown by several studies (Cattell & Warburton, 1967; Hernández-López et al., 1999; Lozano-Bleda et al., 2010; Ortner & Proyer, 2015; Rubio et al., 2004; Santacreu & Hernández, 2018). Lastly, the accuracy of observer-reported measures of these malevolent traits has been the subject of debate in the literature (Baker et al., 2004; Malesza & Kaczmarek, 2020).

Based on these ideas, the primary objective of the current investigation was to conduct a meta-analysis on the precision of observer-reports as a tool for assessing the malevolent Dark Triad and Dark Tetrad personality traits. The study sought to examine the associations between self-reported and observer-reported assessments of these traits (inter-rater agreement), and to determine the effect sizes of the correlations between the two types of reports for each of the dark traits. To this end, two interrelated studies were conducted, resulting in seven and 13 studies that met the inclusion criteria.

Firstly, it is important to mention that, although terms were included in the search equation to obtain results on the four Dark Tetrad traits (since this was the objective), only studies were located that used observer-reports to measure the Dark Triad traits in both versions of the study. No studies were located that measured the Dark Tetrad (i.e., including sadism to the above) using this assessment methodology. A possible reason for this could be the fact that trait sadism was later included to the set of dark traits (Chabrol et al., 2009). In addition, the more recent development of self-report measures specifically designed to assess this trait along with the other three traits could also have contributed to this lack of studies on the use of observer-reports (Paulhus et al., 2021; Plouffe et al., 2017; Webster & Wongsomboon, 2020).

Secondly, it is also interesting to mention the infrequency with which this methodology has been used to assess these malevolent traits, since many studies were excluded because they did not include observer-reports in their measurement. This fact may be due to the existing debate in the literature on its accuracy in measuring personality and to the disadvantages that the use of this methodology may present. Some of these disadvantages are the additional effort required to obtain data from third parties that would be quicker to obtain by asking the target directly, as well as the fact that there is certain personal information that informants cannot access. Other disadvantages are the possible difficulty in assessing very specific behaviors, and the possible presence of biases similar to those of self-report, such as extreme responses or acquiescence (Baker et al., 2004; Malesza & Kaczmarek, 2020; McDonald, 2008).

Thirdly, as for the results obtained in the analyses carried out in this study, the results of both versions of the study revealed a positive association of average magnitude between the three traits assessed with self-report and assessed with observer-report, indicating a positive relationship between these measures. These findings suggest that self-reports and observer-reports of these traits are moderately associated. Furthermore, in line with the studies of Malesza and Kaczmarek (2020) and of Mischel (1968), these results provide support for the accuracy of observer-report since in both versions of the meta-analysis, for all three traits, the correlations exceed the .30 validity cutoff. Thus, the findings indicate that these personality traits can be observed and assessed with some accuracy by others, and these assessments will match quite closely with the targets' perceptions of their own personality traits (Jones & Paulhus, 2014; Luan et al., 2019; Malesza & Kaczmarek, 2020; Vazire, 2010).

Not only can these moderate correlations be explained by the accuracy of the raters (alternative assessment procedures for the same construct) but also by the fact that raters might be observing distinct but related phenomena using different samples of behaviors to reach a conclusion on the same trait (Larsen et al., 2017). In fact, narcissism seems to be one of the most easily observable traits, as the highest associations were obtained for this trait. This fact, according to previous research findings, may be because in the case of narcissism, familiarity exerts a propensity to attract others in analogous circumstances along with the targets. This would mean that narcissism seems to exhibit a consistent pattern with different people. In contrast, it is argued that, when looking at Machiavellianism and psychopathy, raters may be using less similar information or interpreting it more differently (Lämmle et al., 2021; Maaß & Ziegler, 2017). However, in our study psychopathy also appears to be one of the most easily observable traits, along with narcissism. Previous studies also found that psychopathy is one of the easiest traits to observe (He et al., 2018; Jones & Paulhus, 2014; Malesza & Kaczmarek, 2020).

In addition, people with narcissistic traits seem to be aware of their personality and of the need to maintain a narcissistic reputation, so they tend to show themselves to others as they are, i.e., narcissistic. In other words, their need for public recognition may lead them to exhibit behavior that tends to attract the attention and admiration of others and is therefore a more easily observable trait. In contrast, people with Machiavellian traits (the least observable trait according to the results obtained) might present themselves to others as "good", being able to deceive and manipulate others without being perceived by them. This would make it more difficult for others to observe this trait in people, which would lead to an underestimation of the trait (Carlson et al., 2011; Lämmle et al., 2021; Maaß & Ziegler, 2017). In the case of people with psychopathic traits, it is possible that they also show themselves as they are, as narcissists do, and show a lack of concern for the consequences of how they appear to others (e.g., Miller et al., 2011). This differentiation between the visibility of traits would be in line with the definition of each trait (Paulhus & Williams, 2002).

According to the meta-analysis conducted by Connelly and Ones (2010), there is a moderate level of correlation between self-reported personality traits and other-reported personality traits. Specifically, the meta-analysis found correlation coefficients between .08 and .48, with the highest correlations when the others were people closer to the target. This means that there is a positive relationship between the two types of personality reports, but it is not a perfect correlation. Furthermore, the meta-analysis found that the accuracy of observer-reported personality traits varied depending on the trait being assessed. For example, observers were found to be more accurate in assessing extraversion and openness to experience, but less accurate in assessing neuroticism and

agreeableness. Related to the above, observer-reports might be more useful for observing highly observable traits, such as narcissism or psychopathy (Luan et al., 2019; Vazire, 2010).

Also note that in the studies included in both versions of the meta-analysis the highest correlations are those in which those who rated the dark personality of the targets were acquaintances (such as family or friends). Instead, the lowest magnitude correlations were obtained in the studies in which those who rated the personality were other Facebook users or trained research assistants (Maaß & Ziegler, 2017; Vander Molen et al., 2018). Indeed, Study 2 showed that informant type is a variable that moderates the relationship between traits measured with self-report and traits measured with observer-report, with the relationship being stronger when observers are people who know the targets rather than strangers. These results are in line with those obtained in Connelly and Ones' study (2010). However, this was only obtained for narcissism and psychopathy and the reasons could be the same as argued above, although it could also be due to the smaller effect size for this trait ($k = 9$).

These results suggest that dark personality, and more specifically narcissism and psychopathy, are more easily observable by those with a closer relationship with the target, so the greater the familiarity, the greater the accuracy in trait assessment (Connelly & Ones, 2010; Vazire, 2006; Vazire & Mehl, 2008). However, Lämmle et al. (2021) concluded that, in addition to familiarity, personality observability is also determined by the type of situations that occur between the evaluator and the evaluate.

In any case, when interpreting these results, it is important to consider that a significant heterogeneity was observed between samples in the analyzes of the two studies. This indicates that the correlation between self-reports and observer-reports may vary depending on the sample characteristics, including differences in the sample sizes of the included studies. Furthermore, the significant τ^2 values obtained for each analysis suggest that there may be unexplained sources of heterogeneity that should be explored in future research (Hoaglin, 2016).

Overall, the present study provides further evidence for the utility of combining self-report and observer-report measures in the assessment of malevolent personality traits (Abernethy, 2015; Connelly & Ones, 2010; Hofstee, 1994; Kenny, 1988; Kholin et al., 2016; Luan et al., 2019; Malesza & Kaczmarek, 2020; McDonald, 2008; Müller & Moshagen, 2019; Muris et al., 2017; Vazire, 2010; Vazire & Carlson, 2011). Future research should investigate the factors that contribute to heterogeneity in these correlations to provide a more comprehensive understanding of the relationship between the two assessment methodologies of personality traits. Further analysis of the different observability of the Dark Triad traits should also be undertaken, as some seem less visible (Machiavellianism) to others. Therefore, it is proposed as a future line of research to investigate the inclusion of more objective and indirect tests that provide more reliable results on how these malevolent traits behave.

In addition, given the association between these personality traits and numerous forms of criminal behavior (such as physical, verbal or sexual aggressions, cyberviolence, bullying and cyberbullying, sextortion, Intimate Partner Violence, among others), it is crucial to account for potential response biases related to social desirability and to utilize a diverse range of assessment methods to enhance the accuracy and reliability of findings (Alsheikh Ali, 2020; Hayes et al., 2021; Moor & Anderson, 2019; Pineda et al., 2023; Pineda, Galán, et al., 2022; Pineda, Rico-Bordera, et al., 2022; Spaans et al., 2017; Thomas & Egan, 2022).

Limitations and Future Research

The present study is not free of limitations. First, it is important to consider that not many studies met the inclusion criteria, so the analyses were performed with a small sample of studies, which makes it difficult to generalize the results. In addition, the design of these studies was cross-sectional and not longitudinal, which, again, makes it difficult to generalize the results. As a future line of research, it is proposed to continue updating this meta-analysis to provide more reliable results on the accuracy of observer-reports as a methodology for personality assessment in general and, specifically, for Dark Traits.

Furthermore, it is important to consider that in the second version of the meta-analysis an exclusion criterion was removed to increase the number of studies that met the inclusion criteria. Therefore, as a future line of research we propose to replicate this meta-analysis directly using the

inclusion criteria of the second version of this meta-analysis, although we are aware that the number of studies included would be much larger and therefore more difficult to manage.

Finally, it also seems important to mention that the validity of some of the short scales used in the studies included in this meta-analysis (i.e., the SD3 and the DD) have been questioned, considering that, perhaps, these shorter measures are not assessing all aspects of the dark triad traits. Therefore, it is of great importance to review the psychometric properties of both self-reported and hetero-reported scales when conducting research (Muris et al., 2017).

Conclusions

This is the first meta-analysis summarizing studies that have employed observer-reports to measure Dark Traits and providing statistical data on its accuracy as a complementary assessment methodology to self-reports for measuring these malevolent traits. The basis of this work was that observer-reports have been found to be especially useful when dealing with socially desirable or undesirable (rather than neutral) traits because their assessment has greater biases due to the greater likelihood of presenting oneself in more socially desirable terms (Andrews & Meyer, 2003; Echeburúa et al., 2011; Luan et al., 2019; Spaans et al., 2017). Thus, this paper concludes that the assessment of malevolent personality could benefit from the use of observer-report (Luan et al., 2019; Vazire, 2010; Kenny, 1988; Malesza & Kaczmarek, 2020; Muris et al., 2017). In addition, a comprehensive and robust assessment of any given construct is most effectively achieved through the integration of multiple measurement methods (e.g., Kyllonen & Kell, 2018; McDonald, 2008; Ortner & Proyer, 2015).

Data Accessibility Statement

All data generated or analyzed during this study are included in this published article (Table 1 and Table 2). The analysis scripts used for this article can be accessed at https://osf.io/vdsgx/?view_only=422bab65dd3148ea8f0faef4cb7d97a2.

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