



VALIDATION OF THE SPANISH VERSIONS OF THE DISTRESS TOLERANCE SCALE (FULL AND SHORT) IN ARGENTINIAN COLLEGE STUDENTS

VALIDACIÓN DE LAS VERSIONES ESPAÑOLAS (COMPLETA Y BREVE) DE LA ESCALA DE TOLERANCIA AL MALESTAR EN ESTUDIANTES UNIVERSITARIOS ARGENTINOS

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Resumen

Introducción. La tolerancia al malestar es un factor transdiagnóstico de diversos trastornos psicológicos. La evaluación de las propiedades psicométricas de la Escala de Tolerancia al Malestar (ETM) y su versión breve para personas de Sudamérica es limitada. **Método.** Se examinaron las propiedades psicométricas de la versión en español completa y breve de la ETM en una muestra de 514 (70.6% mujeres) estudiantes universitarios argentinos que completaron una encuesta virtual. Se examinaron evidencias de validez estructural e invarianza según sexo. Se examinó la consistencia interna y evidencias de validez concurrente. **Resultados.** Para la versión completa, el modelo de cuatro factores jerárquico mostró el mejor ajuste a los datos, en tanto que la versión breve (cuatro ítems, cada uno con la carga factorial más alta en su dimensión) también mostró un ajuste adecuado. La invarianza en función del sexo fue establecida y la evidencia sobre la consistencia interna y la validez concurrente fue adecuada para ambas versiones. **Conclusiones.** La versión completa y breve de la ETM son válidas y confiables para la población argentina y puede ser de utilidad para identificar a aquellas personas en riesgo (i.e., con bajos puntajes en la ETM) de desarrollar problemas de salud mental.

Abstract

Introduction. Distress tolerance is a transdiagnostic factor for a broad range of psychological disorders. The evaluation of the psychometric properties of the Distress Tolerance Scale (DTS) and its brief version for Spanish-speaking South American individuals is limited. **Method.** We examined the psychometric properties of the full and brief forms of the Spanish version of the DTS in a sample of 514 (70.6% female) Argentinian college students who completed an online survey. We examined evidence of structure validity and measurement invariance by sex. We estimated Cronbach Alpha and McDonald Omega indexes to analyse internal consistency and bivariate correlations to examine evidence of concurrent validity. **Results.** The hierarchical four-factor model showed the best fit to the data for the full version. The brief form (four items with the highest factor loading within each dimension of the full version) also showed an acceptable fit to the data. Measurement invariance across sex was established and both versions exhibited adequate values of internal consistency and evidence of concurrent validity. **Conclusions.** The full and brief form of the DTS is valid and reliable for Argentinian populations and it may be helpful in identifying those at risk (i.e., low DTS scores) for developing mental health problems.

Palabras clave

Tolerancia al malestar; Propiedades psicométricas; Invarianza de medida; Estudiantes universitarios

Key Words

Distress tolerance; Psychometric properties; Measurement invariance; College students

1. Introduction

Low distress tolerance (DT), the perceived or actual capability to withstand negative affect or other uncomfortable psychological or physical states (Greenberg et al., 2016; Leyro et al., 2011; Simons & Gaher, 2005), is an important transdiagnostic cognitive-behavioral risk and maintenance factor for a broad range of disorders, including posttraumatic stress disorder (Akbari et al., 2022), depression (Lass & Winter, 2020), substance use (Anderson et al., 2025; Kechter et al., 2021; Khan et al., 2018; Norton et al., 2023; Pilatti et al., 2022), eating disorders (Rand-Giovannetti et al., 2022) and borderline personality (Mattingley et al., 2022). Changes in DT also seem to mediate the effects of clinical interventions. For example, Zeifman et al. (2020) found, in a clinical sample diagnosed with borderline personality disorder, that a dialectical behavior therapy-based intervention influenced several psychopathologic outcomes (i.e., borderline personality disorder symptoms, general psychiatric symptoms, and social adjustment) through improvements in DT.

Simons and Gaher (2005) developed, in samples of college students, the Distress Tolerance Scale (DTS), a 15-item measure widely used for assessing DT. Findings from this original version evidenced a single second-order general DT factor and four first-order factors (Tolerance, Appraisal, Absorption, and Regulation; 3, 3, 6 and 3 items, respectively) as the underlying structure. These findings also supported adequate reliability (internal consistency and temporal stability) and evidence of criterion-related validity. Tolerance involves the perceived tolerability of distress. Low Appraisal reflects a lack of acceptance of distress, a feeling of shame for experiencing discomfort, and the perception of one's coping abilities as inferior to those of others. Absorption refers to having the attention relatively consumed by the distress, whereas Regulation involves the significant efforts implemented to rapidly avoid/alleviate negative emotions (Simons & Gaher, 2005).

The psychometric properties of the DTS have been examined in several countries: Italy (Melli et al., 2021), Iran (Azizi, 2010), Spain (Sandín et al., 2017), Australia (Brown et al., 2022; Slabbert et al., 2021), Poland (Rokosz & Poprawa, 2020), China (You & Leung, 2012), United States (Leyro et al., 2011), México (González-Ramírez et al., 2019), and Argentina (del Valle et al., 2020). Although findings on internal consistency have demonstrated adequate reliability (i.e., $\alpha > .70$) across dimensions (Allan et al., 2015; Azizi et al., 2010; Brown et al., 2022; Cogle et al., 2013; González-Ramírez et al., 2019; Greenberg et al., 2016; Sandín et al., 2017; Simons & Gaher, 2005; Slabbert et al., 2021), results regarding its structure have been inconsistent, with evidence supporting models ranging from one to four factors, as well as a bi-factor structure.

Precisely, studies conducted with Spanish- (González-Ramírez et al., 2019; Sandín et al., 2017) or English-speaking college samples (Slabbert et al., 2021) replicated the hierarchical four-factor model with all dimensions loading onto a higher-order factor, described in the development study of Simons and Gaher (2005). However, other four-factor models have been proposed and tested. For instance, Brown et al. (2022) found support for a four-factor correlated model (i.e., all dimensions are correlated); while a hierarchical model where Tolerance, Appraisal and Absorption loaded onto a higher-order (i.e., General Distress Tolerance) factor (Regulation remained isolated) presented better fit than the original hierarchical four-factor (Tonarely & Ehrenreich-May, 2020 [clinical sample]; You & Leung, 2012). Furthermore, two studies (Allan et al., 2015; Rogers et al., 2020) observed that a bi-factor model, where each of the 15 items loaded onto a general factor of DT and also on their corresponding factor, showed better fit than the hierarchical four-factor model. Noteworthy, Allan et al. (2015) found that some items did not have significant loadings on their corresponding Absorption and Appraisal factors.

Other studies have found that a three-factor model, where one of these factors grouped together the items from the original Appraisal and Tolerance dimensions, showed adequate fit (Tonarely & Ehrenreich-May, 2020 [general sample]). Furthermore, Rokosz and Poprawa (2020) found that a hierarchical three-factor model, where Tolerance, Appraisal and Absorption -but not Regulation (i.e., deleting the items)- loaded onto a higher-order factor, showed good fit to the data. Notably, studies that conducted both Exploratory Factor Analysis (EFA) and Confirmatory Factor Analysis (CFA) supported a 2-factor structure. Specifically, del Valle et al. (2020) identified

in a sample of college students, via EFA, two correlated factors that were named General Distress Tolerance (12 items) and Regulation (3 items). Additionally, Lee et al. (2024) conducted an EFA and, after deleting six items, a CFA on the remaining 9 items supported a two-factor correlated model with the dimensions Awareness (6 items) and Regulation (3 items). Finally, Melli et al. (2021) reported that, after deleting one item and allowing the correlation of variance between items, a one-factor model presented good fit.

Considering the significant relevance of DT in psychopathology, coupled with promising findings from interventions aimed at enhancing the capacity to withstand distress, the availability of psychometrically sound measures becomes paramount for the precise evaluation of DT in both research and clinical environments. This, combined with the need for brief measures, led to the development of a briefer version of the DTS (Garner et al., 2018). Specifically, using data from a sample comprising individuals with obsessive-compulsive disorder, Garner et al. developed and validated an abbreviated 4-item measure (DTS short-form; DTS-SF). These authors selected the item with the highest factor loading from each of the original DTS subscales (Simons & Gaher, 2005). An EFA conducted on the 4-item scale showed that each item loaded onto a one-factor solution. Then, Brown et al. (2022), in a sample of college students, conducted CFA on the 4-item scale proposed by Garner et al. and found that this one-factor model presented an acceptable-to-moderate fit. The scores of the DTS-SF also presented adequate reliability (Brown et al., 2022; Garner et al., 2018).

The present study

Altogether, the findings suggest mixed evidence regarding the underlying structure of DTS. However, only a few studies have evaluated the psychometric properties of its Spanish version in college students (del Valle et al., 2020; González-Ramírez et al., 2019; Sandín et al. 2017) and fewer have comprehensively compared the fit of the several proposed factor solutions for the measure. Furthermore, the model fit of the Spanish version of the 4-item one-factor model (DTS-SF) has limited examination. This highlights two gaps in the literature regarding the structural validity of the Spanish DTS and its brief version. This is especially relevant in university settings, where prior research with college students has shown that DT mediates the association between distal risk factors (e.g., childhood maltreatment) and psychopathology (e.g., posttraumatic stress disorder and alcohol use; Robinson et al., 2021), and that low DT predicts increases in depression, anxiety (Ranney et al., 2022) and suicidal ideation and suicide risk (Kratovic et al., 2021). Given the high prevalence of mental health problems among college students (Auerbach et al., 2018; Lipson et al., 2022) and the central role of DT in these outcomes, it is crucial to rely on psychometrically sound scores of this construct in this population. Therefore, the present study evaluated, in a sample of Argentinian college students, which of the proposed DTS structures shows better fit for the full measure. We also tested model fit of the DTS-SF 4-item one-factor structure using the Spanish version. Internal consistency of these scores was also examined.

Although limited, some evidence suggests that the full DTS is invariant across sex. For instance, Rogers et al. (2020) and Oorjitham et al. (2024) found that the scores derived from the bi-factor model or the full DTS, respectively, were invariant across sex. While Rogers et al. (2020) did not observe significant differences when comparing the latent general factor and the Regulation factor across sex, others have found higher scores in males vs females (Cogle et al., 2013; Simons & Gaher, 2005). Notably, females appear to be more sensitive to stress than males (Jose & Ratcliffe, 2004), which could impact their DT. If measurement invariance is not supported, comparisons across groups are not valid. Therefore, another aim was to examine measurement invariance of these Spanish versions (full and short-form) across sex. We tested configural (equivalence of model structure), metric (equivalence of factor loadings) and scalar invariance (equivalence of item intercepts; Putnick & Bornstein, 2016).

Previous work has supported the association between DTS scores (dimensions and total score) and measures assessing anxiety, depression, stress, emotion dysregulation (Brown et al., 2022; Labella et al., 2024), emotion suppression (Aguirre et al., 2024; Jeffries et al., 2016), or reappraisal (Jeffries et al., 2016), impulsive behavior (Kaiser et al., 2012), and behaviors such as substance use (Zegel et al., 2019; Anderson et al., 2025) or problematic

internet use (El-Ashry et al., 2023). Consequently, we examined, for the total sample and for each sex, the correlation of the DTS and DTS-SF with relevant-related constructs, including symptoms of negative affect (i.e., depression and social anxiety), emotional regulation strategies, impulsivity-like traits, alcohol-related negative consequences and indicators of social media addiction to provide evidence of concurrent validity.

2. Method

2.1. Participants and Procedures

We used data from the second (and final) wave of a longitudinal study (ELSA, *Estudio Longitudinal Sobre Alcohol*, cohort 2018) aimed at assessing alcohol and marijuana use in Argentinean college students. Using a two-wave design, the broader project sought to identify the prospective associations of personality variables (i.e., trait impulsivity), cognitive variables (i.e., descriptive norms and beliefs about the role of alcohol/marijuana during university life), behavioral variables (i.e., protective behavioral strategies), and contextual variables (i.e., contexts of alcohol/marijuana use) with alcohol and marijuana use and related problems in a sample of first-year students from different university programs. Several variables, including DT, were measured only in the second wave (2019); therefore, the present study focused on these cross-sectional data. At baseline, the research team visited classrooms in two public colleges in Córdoba (Argentina), where first-year students were invited to participate in a two-wave survey study evaluating risk factors associated with substance use. The aims of the study, the voluntary nature of participation, and the confidential handling of the data were thoroughly explained. A total of 3,820 students provided contact information and received an email with a link to an online survey (Qualtrics), which was completed by 1,083 students (64% women; M age = 19.73 ± 3.95). Twelve months later, these participants were invited to complete the second-wave survey. Those who completed the second survey were eligible for a raffle (two cash prizes equivalent to ≈ 22 US dollars each), 10 gift cards (each ≈ 9 US dollars), and ≈ 200 small items (e.g., thermoses, headphones). Participants provided informed consent by clicking on the “next” option in the online survey. A total of 558 students completed at least 80% of the second survey (M age = 21.11 ± 5.13 ; 70.6% [$n = 394$] female and 29.4% [$n = 164$] male). After excluding 44 cases with incomplete DT responses, the analytic sample comprised 514 students (M age = 21.13 ± 5.13 ; age range 18–57 years; 70.6% [$n = 363$] female and 29.4% [$n = 151$] male). The procedures were approved by the institutional ethics committee (PE24).

2.2. Measures

For all measures, composite scores were created by summing/averaging items (reverse-coding of items was conducted for the urgency measures), such that higher scores indicate higher levels of the construct. Internal consistency values for each score in the present study were acceptable (presented in Results).

Distress Tolerance

The Spanish version (Sandín et al., 2017) of the 15-item self-report DTS (Simons & Gaher, 2005) was employed. Each item is rated on a 5-point scale (from 1 = *strongly agree* to 5 = *strongly disagree*).

Symptoms of Social Anxiety and Depression

We used a translated into Spanish version of the 20-item general depression scale and the 5-item social anxiety scale of the Inventory of Depression and Anxiety Symptoms (IDAS, Watson et al., 2007). In the context of an independent and larger cross-cultural study (see Kaminer et al., 2023), the English version of the IDAS was translated into Spanish by three Spanish-speaking psychologists proficient in English and Spanish, and knowledgeable about the rationale of the scale. The general dimension of depression encompasses 10 items from the dysphoria dimension and 10 specific items (i.e., symptoms) from other scales while the social anxiety scale comprises specific items related to experiencing anxiety in social contexts. Participants indicated, on a 5-point scale (from *not at all* to *extremely*), the extent to which they had experienced the symptom of each item during the past two weeks. A CFA within the current sample suggested fairly adequate model fit for the general

depression scale (CFI = 0.958; TLI = 0.950; RMSEA [90% CI] = 0.068 [0.062, 0.074] and the social anxiety scale (CFI = 0.996; TLI = 0.990; RMSEA [90% CI] = 0.058 [0.018, 0.100]).

Emotion Regulation Strategies

The Spanish version (Cabello et al., 2013) of the Emotion Regulation Questionnaire (ERQ; Gross & John, 2003) evaluates cognitive reappraisal (6 items) and expressive suppression strategies (4 items). Participants reported their agreement with each item via a 7-point Likert scale (from 1 = *strongly disagree* to 7 = *strongly agree*).

Negative and Positive Urgency Traits

The Spanish version (Lozano et al., 2018) of the Short UPPS-P Impulsive Behavior Scale (Cyders et al., 2014) measures impulsivity traits. Specifically, we used the dimensions of negative (4 items) and positive urgency (4 items). Each item is rated on a 4-point Likert scale (from 1 = *strongly agree* to 4 = *strongly disagree*).

Negative Alcohol-related Consequences

We used the Spanish version (Pilatti et al., 2014) of the B-YAACQ (Kahler et al., 2005) which includes 24 dichotomous items (*no* = 0; *yes* = 1). Participants indicated whether they had experienced each of the listed problems in the previous month. The total score reflects the total number of consequences that the respondent experienced in that period.

Social Media Addiction

The Spanish version (Pilatti et al., 2021) of the Bergen Social Media Addiction Scale (BSMAS, Andreassen et al., 2016) was used to measure how frequently the participants experienced situations related with the use of social networking (e.g., “*How often during the last twelve months have you tried to cut down on the use of social networking sites without success?*”). The scale includes 6 items rated on a 5-point Likert scale (from 1 = *very rarely* to 5 = *very often*).

2.3. Data Analysis

Structure Validity Evidence

To examine the factor structure of the Spanish version of the full DTS, we conducted nine CFAs to test which of the following models provided better fit (see Figures 1, 2 and 3): (A) one-factor model where all items loaded onto a single factor or dimension; (B) two-factor intercorrelated model comprising the General Distress Tolerance and Regulation dimensions; (C) two-factor intercorrelated model comprising the Awareness and Regulation dimensions; (D) three-factor model where the items comprising the Appraisal and Tolerance dimensions loaded onto the same factor; (E) three-factor hierarchical model where Tolerance, Appraisal and Absorption -but not Regulation (i.e., deleting the items 8, 13 y 14)- loaded onto a higher-order factor; (F) four-factor intercorrelated where items loaded onto their corresponding factor; (G) four-factor hierarchical model where Tolerance, Appraisal and Absorption loaded onto a higher-order factor while Regulation remained isolated; (H) four-factor intercorrelated hierarchical model with all dimensions loading onto a higher-order factor; and (I) bi-factor model where each of the 15 items loaded onto a general factor of DT an also on their corresponding factor. For the Spanish DTS-SF, we conducted a CFA where the same four items (3 [*I can't handle feeling distressed or upset*], 4 [*My feeling of distress are so intense that they completely take over*], 10 [*Being distressed or upset is always a major ordeal for me*] and 13 [*I'll do anything to stop feeling distressed of upset*]) selected by Garner et al. (2018), and also employed by Brown et al. (2022), loaded onto one overall factor.

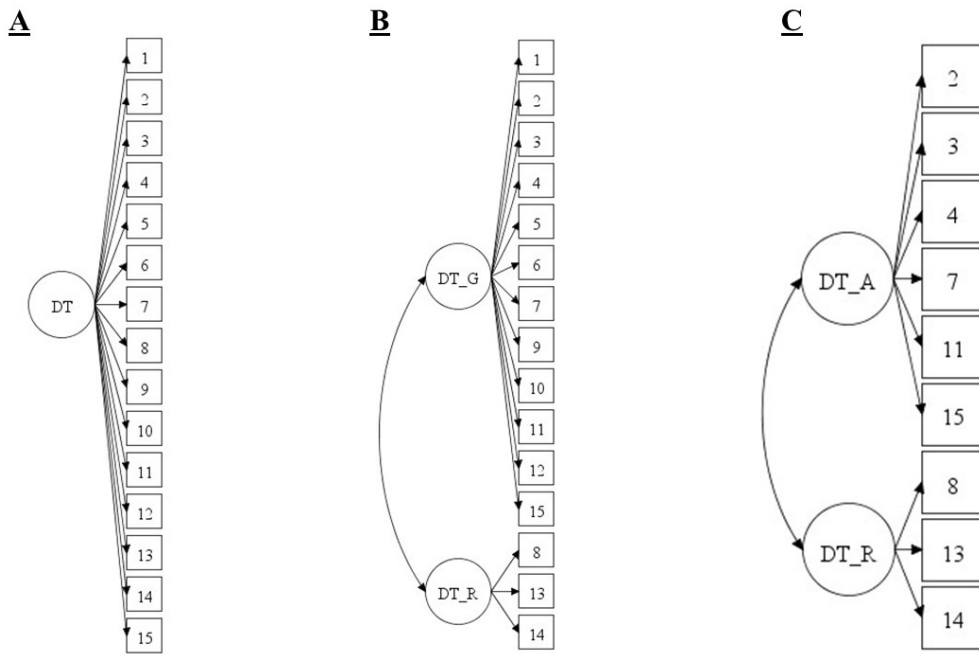


Figure 1

A to C CFA Models

Model A: DT = Distress Tolerance; **Model B:** DT_G = General Distress Tolerance, DT_R = Distress Tolerance Regulation; **Model C:** DT_A = Distress Tolerance Awareness, DT_R = Distress Tolerance Regulation.

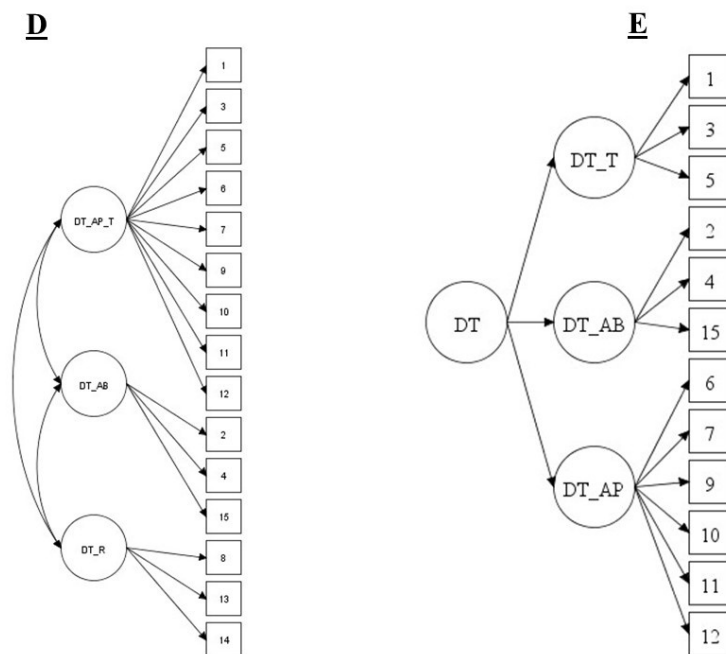


Figure 2

D and E CFA Models

Model D: DT_AP_T = Distress Tolerance Appraisal and Tolerance; DT_AB = Distress Tolerance Absorption; DT_R = Distress Tolerance Regulation. **Model E:** DT = Distress Tolerance higher-order factor; DT_T = Distress Tolerance (dimension); DT_AB = Distress Tolerance Absorption; DT_AP = Distress Tolerance Appraisal.

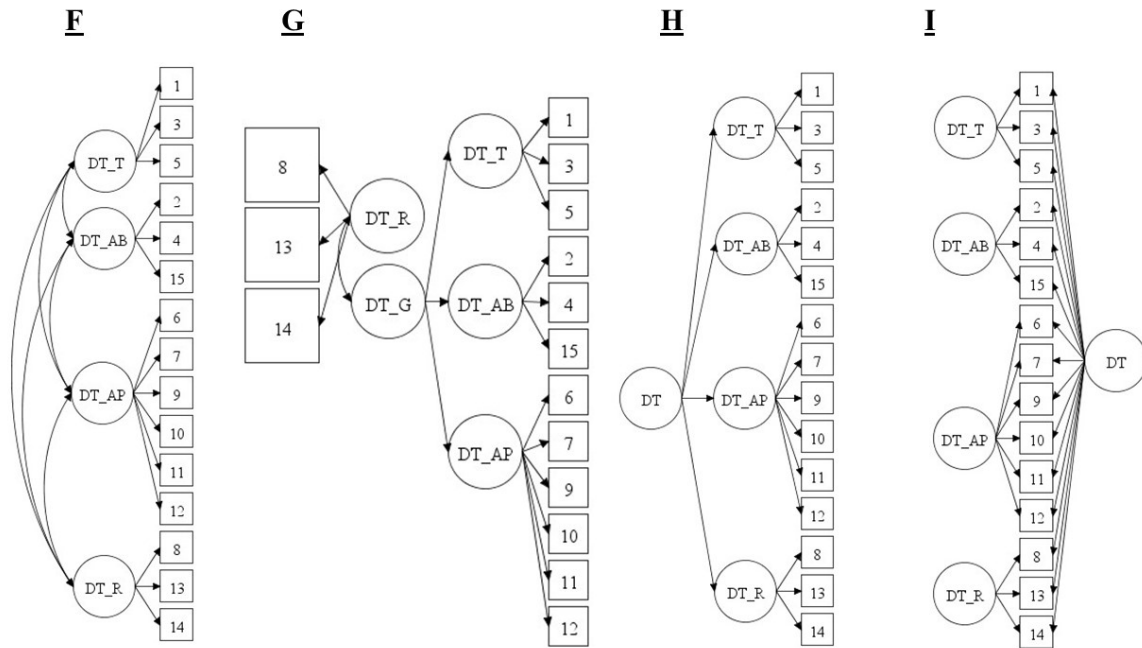


Figure 3

F to I CFA Models

Model F: DT_T = Distress Tolerance (dimension); DT_AB = Distress Tolerance Absorption; DT_AP = Distress Tolerance Appraisal, DT_R = Distress Tolerance Regulation; **Model G:** DT_R = Distress Tolerance Regulation, DT_G = General Distress Tolerance, DT_T = Distress Tolerance (dimension), DT_AB = Distress Tolerance Absorption (dimension), DT_AP = Distress Tolerance Appraisal (dimension); **Model H:** DT = Distress Tolerance higher-order factor, DT_T = Distress Tolerance (dimension); DT_AB = Distress Tolerance Absorption; DT_AP = Distress Tolerance Appraisal, DT_R = Distress Tolerance Regulation; **Model I:** DT_T = Distress Tolerance (dimension); DT_AB = Distress Tolerance Absorption; DT_AP = Distress Tolerance Appraisal, DT_R = Distress Tolerance Regulation, DT = General Distress Tolerance factor.

For all CFAs, we used the robust maximum likelihood estimator (MLR) in *MPlus* (version 8.4; Muthén & Muthén, 2019). Different indices of goodness of fit were considered: Chi-square, the Root Mean Square Error of Approximation (RMSEA), the Standardized Root Mean Square Residual (SRMR), the Tucker-Lewis index (TLI), and the Comparative Fit Index (CFI). A nonsignificant Chi-square value indicates an acceptable fit; however, as this index is highly sensitive to sample size, the remaining indices were considered (Brown, 2015). For RMSEA, values $\leq .050$ and between $.050$ and $.080$ denote good or acceptable fit, respectively. For SRMR, values $\leq .080$ are usually indicative of acceptable fit. For CFI and TLI, values greater than $.900$ or greater than $.950$ are indicative of acceptable and strong fit, respectively (Hu & Bentler, 1995). The following bi-factor model indices were calculated to further evaluate the bi-factor model (Rodríguez et al., 2016): OmegaH (ω_H), explained common variance (EVC) and percentage of uncontaminated correlations (PUC). All these were calculated using the bi-factor indices calculator provided by Dueber (2017). The selection of the model was based on both statistical fit indices and the theoretical interpretability and clinical utility of the models, prioritizing models that provided a meaningful single screening score that can be readily used in applied settings.

Measurement Invariance

We conducted multigroup confirmatory factor analysis (MG-CFAs) with MLR estimator to test whether the best-fitting model was invariant across sex (females and males). A model is interpreted as invariant if the constrained model (i.e., the paths are constrained to be equivalent across groups) does not result in a worse-fitting model. We tested configural (equivalence of model structure), metric (equivalence of factor loadings) and scalar invariance (equivalence of item intercepts; Putnick & Bornstein 2016). The Chi-square difference tests compare a freely estimated multiple-group model to a constrained multiple-group model. However, we estimated the

change in CFI, TLI, RMSEA and SRMR values as Chi-square is sensitive to sample size (Brown, 2015). According to these criteria, measurement invariance is met when the difference on $\Delta\text{CFI}/\Delta\text{TLI}$ is $\leq .010$ (Cheung & Rensvold, 2002), and the difference on ΔRMSEA and ΔSRMR is $\leq .015$ (Chen, 2008; Putnick & Bornstein, 2016).

Reliability

We calculated the internal consistency of the scores of each of the four scales of the DTS and for the total score (for both, DTS and DTS-SF) through Cronbach's Alpha (α) and composite reliability analysis McDonald Omega (ω). Values $\geq .700$ are considered as acceptable and $\geq .800$ as satisfactory.

Concurrent Validity Evidence

We calculated the correlations of the DTS (dimensions and total score) and DTS-SF with scores of emotional psychopathology (i.e., depression and social anxiety), emotion regulation strategies (i.e., cognitive reappraisal and expressive suppression strategies), impulsivity traits (i.e., negative and positive urgency), alcohol-related negative consequences and social media addiction, in the total sample and across sex. Correlations greater than .100, .300 and .500 were considered small, moderate and large, respectively (Cohen, 1992). Additionally, using an exploratory heuristic method, we tested differences in strength of correlation coefficients across sex to outline if the criterion-related variables were differentially associated to distinct dimensions and total score of distress tolerance. As done in prior research (Mezquita et al., 2021; Roozen et al., 2020), we focused on the magnitude of these differences given that statistical tests of such differences may be over-sensitive to small differences including differences in sample sizes by groups. Specifically, we considered differences < 1 SD to be small, between 1 SD and 2 SD were considered medium, between 2 SD and 3 SD were considered large and difference greater to 3 SD were considered substantial (Fisher, 1915).

3. Results

Structure Validity Evidence

Full Distress Tolerance Scale

CFA results are presented in Table 1. Model A (i.e., one-factor model), Model B (i.e., two-factor intercorrelated model comprising the General Distress Tolerance and Regulation dimensions), Model C (i.e., two-factor intercorrelated model comprising the Awareness and Regulation dimensions), Model D (i.e., three-factor model where the items comprising the Appraisal and Tolerance dimensions loaded onto the same factor) and Model E (i.e., three-factor model where Tolerance, Appraisal and Absorption loaded onto a higher-order factor) showed poor fit to the data. Model F (i.e., four-factor intercorrelated where items loaded onto their corresponding factor), Model G (i.e., four-factor hierarchical model where Tolerance, Appraisal and Absorption loaded onto a higher-order factor while Regulation remained to isolate) and Model H (i.e., four-factor intercorrelated hierarchical model with all dimensions loading onto a higher-order factor) presented an acceptable fit (based on CFI, TLI, RMSEA and SRMR). Model I (i.e., bi-factor model where each of the 15 items loaded onto a general factor of DT and also on their corresponding factor) presented inadequate estimation of the covariance matrix; however, after allowing the factor loadings of the first item of each dimension to be freely estimated, the model showed acceptable fit. Despite adequate fit to the data of Model I, factor loadings for items 5 (onto the Tolerance factor), 2, 4, and 15 (onto the Absorption factor), 6, 7, 9, and 10 (onto the Appraisal factor) were low ($< .350$ [item 15 presented a factor loading of .364]). The EVC, PUC and ω_H indices for the general factor were 0.658, 0.771 and .830, respectively. When EVC and PUC are $> .700$, common variance within a model can be regarded as essentially unidimensional (Rodriguez et al. 2016), and when ω_H is $> .800$, the total scores can be considered essentially unidimensional (Reise et al., 2013). The results did not support a unidimensional conceptualization of DTS based on EVC, and marginally did based on PUC and ω_H .

Although indices of model fit for models F, G and H were highly similar, we retained Model H because it captures the originally proposed structure, which allows to estimate both the scores for each dimension and a total score

(i.e., the latent construct). The use of a total score may be useful in contexts where a broad range of constructs are measured. Also, the use of individual subscales, although is less parsimonious, provides a more comprehensive approach of the mechanisms underlying DT (Sandin et al., 2017; Slabbert et al., 2021). In Model H, all items loaded significantly on their hypothesized dimension and presented standardized factor loadings > .350. Specifically, factor loadings for Tolerance ranged from .657 to .886; for Appraisal ranged from .375 to .795; for Absorption ranged from .765 to .808; and for Regulation ranged from .581 to .876. All dimensions loaded significantly onto a higher-order factor and the factor loadings were > .50 (range from .504 to .960, Table 2).

Distress Tolerance Scale-Short Form

The CFA showed an acceptable fit to the data (Table 1), with all four items loading significantly onto the factor (standardized factor loadings ranging from .423 and .807). These findings are presented in Table 2.

Table 1
Confirmatory factor analysis fit results for models of the Distress Tolerance Scale

Model	CFI	TLI	RMSEA (CI 90%)	SRMR	χ^2	<i>g</i>
<i>Full form</i>						
A. One factor	.766	.727	.117 (.110, .125)	.079	727.422*	90
B. Two factors intercorrelated ¹	.849	.822	.095 (.087, .103)	.061	499.904*	89
C. Two factors intercorrelated ²	.913	.879	.095 (.080, .110)	.054	145.572*	26
D. Three factors intercorrelated	.864	.836	.091 (.083, .099)	.056	456.361*	87
E. Three factors intercorrelated - hierarchical	.767	.728	.117 (.109, .125)	.158	723.598*	90
F. Four factors intercorrelated	.928	.910	.067 (.059, .076)	.052	279.244*	84
G. Four factors intercorrelated – hierarchical ³	.919	.902	.070 (.062, .079)	.058	305.537*	86
H. Four factors intercorrelated – hierarchical⁴	.919	.902	.070 (.062, .079)	.058	305.536*	86
I. Bi-factor	.941	.917	.065 (.055, .074)	.046	235.592*	75
<i>Short form</i>						
One factor	.986	.959	.071 (.020, .130)	.020	7.147*	

Note. CFI = Comparative Fit Index; TLI = Tucker–Lewis Index; RMSEA = Root Mean Square Error of Approximation; CI = Confidence Interval; Standardized Root Mean Square Residual (SRMR); χ^2 = Chi-Square test. Bold indicates the selected model. ¹ Model B = Model proposed by del Valle et al. (2020). ² Model C = Model proposed by Lee et al. (2024) ³Model G = Model proposed by You and Leung (2012). ⁴ Model H = Model proposed by Simons and Gaher (2005). * $p < .01$

Table 2

Factor loadings for the 4-factor intercorrelated hierarchical model of the Distress Tolerance Scale and for the selected items of the Distress Tolerance Scale Short-Form

	DTS				DTS-SF
	Tolerance	Appraisal	Absorption	Regulation	
Item 1	.762				
Item 3	.886				.620
Item 5	.657				
Item 6		.375			
Item 7		.503			
Item 9		.603			
Item 10		.795			.807
Item 11		.642			
Item 12		.763			

	DTS				DTS-SF
	Tolerance	Appraisal	Absorption	Regulation	
Item 2			.765		
Item 4			.808		.723
Item 15			.801		
Item 8				.684	
Item 13				.876	.423
Item 14				.581	
<i>Loadings on the general factor</i>	.766	.960	.892	.504	

Note. Items with the highest loading within each dimension are in bold. DTS = Distress Tolerance Scale; DTS-SF = Distress Tolerance Scale Short-Form

Measurement Invariance

Full Distress Tolerance Scale

In the MG-CFA for Model H, all indices (CFI = .932, TLI = .915, RMSEA = .065 [.055, .074], SRMR = .056) supported configural invariance of the model across sex. All indices (CFI = .931, TLI = .919, RMSEA = .063 [.054, .073], SRMR = .059) and the minimal change on these values (Δ CFI = .001; Δ TLI = -.004; Δ RMSEA = .002; Δ SRMR = -.003) supported metric invariance. Scalar invariance was supported based on all indices (CFI = .927, TLI = .920, RMSEA = .063 [.054, .072], SRMR = .060) and the minimal change on these values (Δ CFI = .004; Δ TLI = -.001; Δ RMSEA = .000; Δ SRMR = -.001).

Distress Tolerance Scale-Short Form

All indices (CFI = .986, TLI = .958, RMSEA = .071 [.000, .133], SRMR = .023) supported configural invariance of the model across sex. All indices (CFI = .984, TLI = .972, RMSEA = .058 [.000, .106], SRMR = .037) and the minimal change on Δ CFI (.002), Δ RMSEA (.013) and Δ SRMR (-.014) but not on Δ TLI (-.014) supported metric invariance of the model. Scalar invariance was supported by all indices (CFI = .990, TLI = .988, RMSEA = .038 [.000, .083]; SRMR = .037) and the minimal change on Δ CFI (-.006) and Δ SRMR (.000) but not on Δ TLI (-.016) and Δ RMSEA (.020).

Reliability

The four dimensions and the total score of the DTS and the DTS-SF showed acceptable internal consistency based on Cronbach's Alpha and McDonald's Omega values. These results are presented in Table 3.

Concurrent Validity Evidence

Full DTS (total score and dimensions) and the DTS-SF correlated positively and significantly. Moreover, the correlations between the DTS (full and brief) and the criterion-related variables were similar in terms of size and direction. Specifically, the total score of the DTS was significantly negatively associated with symptoms of depression, with symptoms of social anxiety, negative urgency, social media addiction, expressive suppression, positive urgency, and alcohol-related negative consequences. The DTS-SF was significantly negatively associated with symptoms of depression and social anxiety, negative urgency, social media addiction, expressive suppression, positive urgency, and alcohol-related negative consequences.

Tolerance was significantly negatively associated with symptoms of depression, negative urgency, symptoms of social anxiety, expressive suppression, and alcohol-related negative consequences. Appraisal was significantly negatively associated with symptoms of depression, with symptoms of social anxiety, negative urgency, social media addiction, expressive suppression, positive urgency, and alcohol-related negative consequences. Absorption was significantly negatively associated with symptoms of depression, with symptoms of social anxiety, negative urgency, social media addiction, expressive suppression, positive urgency, and alcohol-related negative consequences. Appraisal and Absorption were also significantly positively associated with cognitive

reappraisal. Regulation was significantly negatively associated with symptoms of depression, social anxiety, cognitive reappraisal, expressive suppression, negative urgency, and social media addiction. These results are presented in Table 3.

Table 3

Bivariate correlations among the variables, descriptive statistics, and internal consistency values

	DTS Tolerance	DTS Appraisal	DTS Absorption	DTS Regulation	DTS	DTS-SF	<i>M</i>	<i>SD</i>	α	ω
DTS Tolerance							2.50	1.09	.798	.809
DTS Appraisal	.566*						3.18	.87	.784	.799
DTS Absorption	.649*	.705*					2.87	1.13	.831	.835
DTS Regulation	.451*	.387*	.324*				2.79	1.01	.754	.769
DTS	.813*	.883*	.844*	.633*			42.80	11.35	.893	.896
DTS-SF	.776*	.784*	.836*	.614*	.940*		11.61	3.95	.736	.750
Depression	<u>-.339*</u>	-.564*	-.508*	<i>-.190*</i>	-.527*	<u>-.494*</u>	50.57	13.83	.899	.904
Social Anxiety	<i>-.262*</i>	<u>-.439*</u>	<u>-.366*</u>	<i>-.195*</i>	<u>-.413*</u>	<u>-.356*</u>	9.28	4.43	.821	.824
Cognitive Reappraisal	<i>-.061</i>	.187*	.201*	<i>-.246*</i>	.030	.059	4.90	1.09	.813	.814
Expressive Suppression	<i>-.102*</i>	<i>-.196*</i>	<i>-.096*</i>	<i>-.108*</i>	<i>-.170*</i>	<i>-.138*</i>	4.03	1.25	.708	.721
Negative Urgency	<u>-.342*</u>	<u>-.479*</u>	<u>-.473*</u>	<i>-.160*</i>	<u>-.474*</u>	<u>-.436*</u>	2.12	.72	.751	.751
Positive Urgency	<i>-.113*</i>	<i>-.242*</i>	<i>-.202*</i>	<i>-.064</i>	<i>-.208*</i>	<i>-.199*</i>	1.60	.59	.766	.768
Alcohol-related negative consequences	<i>-.172*</i>	<i>-.247*</i>	<i>-.266*</i>	<i>-.042</i>	<i>-.247*</i>	<i>-.218*</i>	3.93	3.78	.826	.832
Social Media Addiction	<i>-.291*</i>	<u>-.328*</u>	<u>-.359*</u>	<i>-.130*</i>	<u>-.355*</u>	<u>-.328*</u>	14.62	5.09	.771	.772

Note. DTS = Distress Tolerance Scale; DTS-SF = Distress Tolerance Scale Short-Form; * = significant correlations ($p < 0.05$). Large correlations are bolded, moderate correlations are underlined and small correlations are italicized (Cohen, 1992).

In Table 4, we summarized the differences in correlation coefficients across sex. Medium differences were italicized and large differences were bolded. We found one large difference which was between cognitive reappraisal strategies and the total score of the DTS, showing a small, positive and significant correlation in female sample ($r = .121$ [see supplementary Table 1]) and a small, negative, and a non-significant correlation in male sample ($r = -.135$ [see supplementary Table 1]). We did not observe any other substantial differences.

Table 4

Correlation differences across sex between the dimensions and total score of the DTS and DTS-SF and the criterion-related variables scores.

	Tolerance	Appraisal	Absorption	Regulation	DTS	DTS-SF
Depression	.096	.108	.000	.101	.066	.055
Social Anxiety	.149	.083	.041	.089	.083	.156
Cognitive Reappraisal	<i>.168</i>	<i>.217</i>	<i>.204</i>	<i>.207</i>	.256	<i>.222</i>
Expressive Suppression	.163	.094	.009	.121	.103	.073
Negative Urgency	.024	-.016	.024	.085	-.001	.047
Positive Urgency	.096	.032	.137	.017	.065	.097
Alcohol-related negative consequences	.177	.071	.041	-.101	.095	.132
Social media addiction	.048	.148	.125	.122	.120	.100

Note. Medium correlation differences are italicized ($.164 < r_{diff} < .233$), large differences are bolded ($.233 < r_{diff} < .330$) (Fisher, 1915).

4. Discussion

Past research surrounding the factor structure of the full version of DTS has been disparate and studies examining model fit of the proposed models with the Spanish version of this scale are scarce. Moreover, the short-form of the DTS has not been well validated in Spanish-speaking contexts. We addressed each of these gaps by testing several models previously evaluated for the full DTS and validating the short form of the Spanish version of the DTS in a sample of Argentinian college students.

For the full DTS, results showed that the four-factor hierarchical model, proposed by the original English version of the DTS (Simons & Gaher, 2005), posits an adequate fit to the data and was therefore retained. Our findings align with past studies that captured a factor structure that comprises four dimensions (Appraisal, Regulation, Tolerance, Absorption) anchoring a General Distress Tolerance factor (González-Ramírez et al., 2019; Sandín et al., 2017; Slabbert et al., 2021). As we described earlier, the four-factor hierarchical model means that first-order factors are grouped under a general latent variable underlying the more specific dimensions, which allows the use of a total score. Furthermore, employing separate subscales allows for a more detailed insight into the processes behind DT. Further, even though the fit of models F and G was better than of model H, we retained model H because it has practical significance in the context of clinical research, where a broad range of constructs are measured and professionals may need a single score to screen which individuals are at risk (i.e., low DT). Indeed, psychometric literature recommends considering the theoretical and practical implications of a model beyond its global fit (Hair et al., 2019). It should be noted that it is quite common for screening or brief clinical measures to explicitly decide to use a single total score because it is more practical in applied settings. For instance, Kessler et al. (2003) developed the K10 specifically as brief screens for serious mental illness, used as one overall distress score and validated via Receiver Operating Characteristic curves and cut-offs.

Related to the short-form of the DTS, results showed an acceptable fit to the data and the four selected items loaded significantly onto the factor (standardized factor loadings were all $>.40$). These findings are consistent with studies conducted with the English short version (Brown et al., 2022; Garner et al., 2018). Furthermore, others supported a unidimensional structure for the full version of the DTS (Melli et al., 2021; Rogers et al., 2020) which is consistent with our results of the structure of the short-form of the DTS. Regarding the internal consistency of our short-form all Cronbach Alpha and McDonald Omega values were, in line with former studies (Brown et al., 2022; Garner et al., 2018), at least acceptable.

A novel contribution of our study was that, across all indices, our findings supported the notion that the full DTS was invariant across sex at the configural, metric and scalar level. Regarding the short-form, the evidence concerning scalar and metric invariance across sex was mixed. Past research conducted in the context of both Classical Test Theory (Rogers et al., 2020) and Item Response Theory (Oorjitham et al., 2024) supported invariance across sex for the full DTS. Although such studies provide crucial evidence, measurement invariance for the short-form of the DTS was scarcely examined, and mainly in relation to psychopathology (e.g., symptoms of depression [Brown et al., 2022] or suicidal behavior [Slabbert et al., 2021]). Thus, the present study provides pivotal evidence supporting the invariance of a short-form to assess distress tolerance in female and male Argentinian college students. Nevertheless, further research is needed to establish the metric and scalar invariance of scores from the short form of the DTS, as our results supported such invariance for some but not all indices.

Regarding evidence of concurrent validity, the total scores from the full and the short-form of the DTS were negatively and significantly correlated with symptoms of depression and social anxiety, expressive suppression emotion regulation strategies, positive and negative urgency traits, alcohol-related negative consequences, and social media addiction. The association of DT with lower levels of symptoms/behaviors is consistent with a

potential protective role of DT (e.g., Brown et al., 2022; Jeffries et al., 2016; Kaiser et al., 2012; Pilatti et al., 2022; Zegel et al., 2019).

Despite an overall similitude between the female and males' subsamples in strength of correlations between DTS (and subscales) and outcomes, one difference is worth discussing. The expected positive association between the scores of the full and the short DTS and cognitive reappraisal (an adaptative strategy for emotion regulation) was found only in females, a result reflected in a large sex-related difference in these correlations. This may relate to findings indicating that females are more prone to use cognitive reappraisal than males (Haver et al., 2023).

4.1. Implications

DT has been identified as a transdiagnostic factor associated with a broad range of psychopathologic disorders (Akbari et al., 2022; Lass & Winter, 2020; Mattingley et al., 2022; Pilatti et al., 2022) and a key component of psychotherapeutic treatments such as Dialectical Behavior Therapy-based interventions (Zeifman et al., 2020) and Mindfulness-based programs (Muhomba et al., 2017). Moreover, particularly in the context of repeated measurements (e.g., evaluation of efficacy of interventions and longitudinal studies), there has been a demand for easy and quick methods to administer measures, reducing the burden on participants. The present findings provide evidence concerning the psychometric properties of the short-form of the DTS in a sample of Argentinian college students. Prior research indicated that around one out of four of Argentinian college students reported symptoms suggesting severe/extreme emotional psychopathology (Leonangeli et al., 2024) while close to 40% are experiencing symptoms indicative of depression (Mezquita et al., 2019). Moreover, alcohol use is normative in this population and around 60% of last-month alcohol users engage in heavy episodic drinking (Pilatti et al., 2023). In this context, valid measures to assess DT, particularly the short form DTS, could significantly improve the detection of students at risk for suffering mental health problems or substance misuse. The brief measure offers an appealing alternative for its use in clinical settings to evaluate the efficacy of treatments including training in DT skills to manage emotional distress. Future research could enhance the use of the DTS-SF in clinical settings by establishing normative criteria and guidelines to interpret the score of the instrument.

4.2. Limitations and future directions

The study has some limitations. First, the convenience sampling procedure impedes the generalization of our findings to other Argentinian college students, the remaining Argentinian population or other Spanish-speaking populations. Additionally, the response style of the participants was not controlled; future studies should benefit from using attention check questions to exclude invalid responding patterns. Additionally, the substantial attrition between waves likely introduced bias and may have affected the stability and generalizability of our findings, as participants who remained in the study may differ systematically from those who were lost to follow-up. Moreover, our sample was mainly composed of female participants which, although a common feature in health-related studies (Glass et al., 2015), impacts the external validity of the present findings and the stability of the MG-CFA parameters when invariance across sex was tested. Research with more diverse samples of college students is needed, not only in the Argentinian context but also with students from other countries/cultures. Considering the relevance of DT in the clinical context, it would be beneficial to analyze the measurement invariance of the short-form of DTS across levels of severity of psychopathology disorders. Furthermore, future longitudinal research should examine other psychometric properties such as predictive validity, test-retest reliability and longitudinal invariance.

4.3. Conclusions

This study represents a significant contribution to the field of distress tolerance assessment. The full and short forms of the DTS have adequate psychometric properties considering our results on structural and concurrent validity and internal consistency. Thus, both the short and long forms of the DTS could be used to evaluate DT in Argentinian college students.

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4.5. Conflict of interest

None to declare.

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4.7. Author contributions

PC: Methodology, Validation, Formal analysis, Data curation, Writing – original draft, Writing – review and editing, Visualization. GRM: Writing – review and editing, Visualization. YM: Methodology, Writing – review and editing, Visualization, Funding acquisition, Project administration. AJB: Writing – review and editing, Visualization. RMP: Writing – review and editing, Visualization. AP: Methodology, Validation, Formal analysis, Investigation, Resources, Data curation, Writing – original draft, Writing – review and editing, Visualization, Funding acquisition, Supervision, Project administration.

4.7. Data availability

The datasets generated during and/or analyzed during the current study are not publicly available due confidentiality reasons but are available from the corresponding author on reasonable request.

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Supplemental Table 1*Bivariate correlations among study variables across sex between DTS, DTS-SF scores and criterion variables*

Female (n = 363)	Tolerance	Appraisal	Absorption	Regulation	DTS	DTS-SF
Depression	-.293*	-.523*	-.490*	-.153*	-.493*	-.460*
Social Anxiety	-.226*	-.425*	-.370*	-.171*	-.402*	-.326*
Cognitive Reappraisal	-.024	.238*	.249*	-.195*	.121*	.111*
Expressive Suppression	-.067	-.185*	-.113*	-.077	-.154*	-.137*
Negative Urgency	-.324*	-.476*	-.457*	-.130*	-.466*	-.412*
Positive Urgency	-.107*	-.259*	-.198*	-.068	-.219*	-.205*
Alcohol-related negative consequences	-.105	-.219*	-.246*	-.009	-.202*	-.167*
Social media addiction	-.265*	-.277*	-.311*	-.088	-.308*	-.286*
Male (n = 151)						
Depression	-.389*	-.631*	-.490*	-.254*	-.559*	-.515*
Social Anxiety	-.375*	-.508*	-.411*	-.260*	-.485*	-.482*
Cognitive Reappraisal	-.192*	.021	.045	-.402*	-.135	-.111
Expressive Suppression	-.230*	-.279*	-.122	-.198*	-.257*	-.210*
Negative Urgency	-.348*	-.460*	-.481*	-.215*	-.465*	-.459*
Positive Urgency	-.203*	-.291*	-.335*	-.085	-.284*	-.302*
Alcohol-related negative consequences	-.282*	-.290*	-.287*	.092	-.297*	-.299*
Social media addiction	-.313*	-.425*	-.436*	-.210*	-.428*	-.386*

Note. DTS = Distress Tolerance Scale; DTS-SF = Distress Tolerance Scale Short-Form; * = significant correlations ($p < 0.05$).