

# Do healthy habits regulate the relationship between psychosocial dysfunction by COVID-19 and bidimensional mental health?

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Pilar Rico-Bordera<sup>1</sup> , Raquel Falcó<sup>1</sup> ,  
Verónica Vidal-Arenas<sup>2</sup>  
and José Antonio Piqueras<sup>1</sup> PSICO-RECURSOS Group\*

## Abstract

COVID-19 has affected mental health and well-being. Lifestyles are relevant to understand the impact of psychosocial dysfunctions. The objective was to examine the role of healthy habits in the relations between psychosocial dysfunction and psychological well-being/distress during COVID-19. Participants completed measures of psychosocial dysfunction, healthy habits, life satisfaction, well-being, depression, and anxiety symptoms. Psychosocial dysfunction was associated with distress symptoms, while health habits were associated with well-being. Healthy habits were mediators: greater psychosocial dysfunction was associated with less healthy habits, which in turn were associated with lower overall well-being, and greater depression. Programs addressing healthy habits can be of great utility.

## Keywords

bidimensional mental health, COVID-19 pandemic, healthy habits, mental health, psychosocial dysfunction

## Introduction

In December 2019 a severe acute respiratory syndrome caused by a type 2 coronavirus (SARS-CoV-2) was discovered in China and subsequently renamed COrona VIRUS Disease

19 (hereafter COVID-19) (World Health Organization (WHO), 2020; Zhou et al., 2020). Given the alarming levels of spread and severity, this new disease was characterized as a pandemic in early 2020 (Pan American Health Organization, 2020). Since the beginning of the

<sup>1</sup>Miguel Hernández University of Elche, Spain

<sup>2</sup>Universitat Jaume I, Spain

\*The PSICO-RECURSOS COVID-19 study group is composed of (in alphabetical order): Raquel Falcó, Miguel Hernandez University (UMH); Alfonso Lopez-Nuñez, UMH; Agustín E. Martínez-González, University of Alicante; Juan Carlos Marzo, UMH; Ornela Mateu, UMH; Beatriz Moreno-Amador, UMH; David Pineda, UMH; José A. Piqueras, UMH;

Maria Rivera-Riquelme, UMH; Tiscar Rodríguez-Jiménez, Catholic University of Murcia; Victoria Soto-Sanz, UMH; Verónica Vidal-Arenas, Universitat Jaume I.

## Corresponding author:

Raquel Falcó, Health Psychology Department of the Centre of Applied Psychology, Miguel Hernández University of Elche, Avinguda de la Universitat d'Elx, s/n, Alicante, 03202, Spain.  
Email: [rhalco@umh.es](mailto:rhalco@umh.es)

disease's emergence, COVID-19 has been responsible for an estimated 238.3 million infections and 4.9 million deaths worldwide (Statista, 2021a, 2021b).

Because of the state of alarm declared by the different governments, regulations have been imposed to curb the spread of the virus, such as the use of masks, restrictions on the opening of establishments and on movement on public roads, social distancing, or home confinement (Real Decreto 21/2020, 2020). However, several systematic reviews have shown that these restrictions have changed the lifestyle of many people, having a negative effect on their eating, physical activity and sleeping habits (e.g. González-Monroy et al., 2021; Jahrami et al., 2022; Stockwell et al., 2021).

Simultaneously, different studies have confirmed the negative impact that this disease, and the restrictions imposed therefore, have had on people's mental health. In general terms, symptoms of anxiety, depression, post-traumatic stress disorder, psychological distress and stress have been identified in the general population (including people who have suffered from the disease) (e.g. Arora et al., 2022; Schou et al., 2021; Vindegaard and Benros, 2020; Xiong et al., 2020). More specifically, in China 34.1% of quarantined participants reported experiencing some psychological symptom, there being a greater psychological impact on these individuals than on those who were not quarantined (Wang et al., 2021); and in the United States of America, increased suicidal ideation was reported (Czeisler et al., 2020). In turn, in Spain, a meta-analysis indicated an overall prevalence of mental problems symptoms in the general population of 19% (Zhang et al., 2022).

Another example of the negative consequences of Covid on people's mental health is the negative impact it has had on the workplace. It is known that there has been an increase in the loss of income and, consequently, in mental health problems, such as depression, anxiety, worry, and disinterest. Job insecurity, isolation, and job uncertainty increase these psychological consequences (Giorgi et al., 2020; Singh et al., 2021). It has also been studied that during a period of uncertainty, such as a pandemic,

workers are much more sensitive to work-related rumors, leading to emotional exhaustion and role ambiguity. In turn, this perceived job insecurity can be lessened by good communication, which must be backed by high-quality organizational support (Charoensukmongkol and Puyod, 2021, 2022; Puyod and Charoensukmongkol, 2021). With all these data, COVID-19 has had a negative effect on people's mental health. However, mental health was already a global problem of public health concern before the emergence of this disease. For example, it is known that one in four college students have already experienced suicidal ideation and the number of people with psychological problems and the indirect costs involved are expected to increase in the coming years (Mortier et al., 2018; Sowers et al., 2019). In addition, distress (generalized anxiety and depression symptoms) has been linked to subsequent suicide thoughts and behaviors, especially in young people (Auerbach et al., 2018; Johnson et al., 2018). Therefore, given the symptomatology caused by COVID-19, studying how this disease affects distress could help us to prevent, among other problems, suicidal ideation.

Other studies have emphasized the importance of lifestyle interventions to treat mental problems. Several meta-analyses and reviews (e.g. Arora and Grey, 2020; Bourke et al., 2022; Firth et al., 2020) have found that physical inactivity, unhealthy eating and sleeping patterns, smoking and substance use are risk factors for various mental disorders. This data highlighted the importance of working on lifestyle to improve mental health by improving modifiable behaviors with a transdiagnostic approach. Along these lines, Przybylko et al. (2021) and Ransing et al. (2020) in their COVID-19 action plans mention the importance of good sleep, eating and physical exercise habits; another study has already tested the efficacy of a lifestyle intervention and its impact on quality of life in university employees during COVID-19 (García-Pérez de Sevilla et al., 2021); and other studies have also highlighted the role of "mindfulness," which has been shown to be a crucial factor that helped people deal effectively with psychological problems such as anxiety, depression, and stress during the pandemic (e.g.

Suthatorn and Charoensukmongkol, 2022; Yeun and Kim, 2022).

More specifically, which is the negative impact on mental health caused by COVID-19, the WHO (2021) published a series of recommendations for taking care of mental health (especially during house confinement), among which the following stand out: getting up and going to bed at a similar time, not neglecting personal hygiene, eating healthy meals, setting schedules for work and rest, exercising regularly, setting aside time for pleasurable activities, maintaining social contact (through social networks if physical contact is not possible), avoiding alcohol and drugs, and controlling time spent using technologies.

Although the importance of working on lifestyle in dealing with mental health problems is evident, it sometimes seems to be overlooked (Merlo and Vela, 2022). Even so, different studies have tested the positive association of healthy habits (such as Mediterranean diet, sleep time, or physical exercise) with psychological well-being (e.g. Dragun et al., 2020; Redeker et al., 2018; Xu et al., 2016). In turn, unhealthy habits, such as excessive hours of screen time, have been associated with psychological distress, leading young people aged 14–17 to be twice as likely to have been diagnosed with depression and/or anxiety (Twenge and Campbell, 2018). Furthermore, in relation to subjective impact of COVID-19, studies have shown that it significantly affected people's quality of life and subjective well-being (Dragun et al., 2020; Every-Palmer et al., 2020; Zacher and Rudolph, 2021).

Healthy habits have also been studied as mediators between different predictors and psychological well-being or distress. Thus, for example, the relations between spirituality and psychological well-being has been found to be mediated by health behaviors, such as proper nutrition habits and pro-health practices (Božek et al., 2020). Smoking and drinking have also been found to mediate the relations between chronotype (in other words, being “early risers” or “late risers”) and psychopathology symptoms, such as depression, stress, and

fatigue (Wittmann et al., 2010). Similarly, the relations between coping styles and psychological distress is mediated by exercise habits and, to a lesser extent, by sleep (Tada, 2017). Moreover, their mediating role has also been studied during COVID-19 confinement. Thus, they mediate the relations between self-regulation and well-being and mental health (Sousa et al., 2021); between well-being and physical, nutritional and emotional health (Corbí et al., 2021); and internet addiction mediates the relations between home conditions during confinement and psychological distress (Del Líbano et al., 2021).

It is important to consider the psychosocial dysfunction generated by psychological problems and the need to include psychosocial interventions in psychological treatments (Redondo de Freitas, 2018; WHO, 2003). Fusar-Poli et al. (2020: 41) have proposed the following definition for good mental health: “state of well-being that allows individuals to cope with the normal stresses of life and function productively.” Therefore, the negative impact that COVID-19 has had on people's lives, and the psychosocial dysfunction caused therefore, is a highly relevant issue today. In addition, it is important to note that the DSM-5 (Diagnostic Manual of Mental Disorders, Fifth Edition) Diagnostic Criteria Reference Guide includes interference as one of its mandatory criteria common to all clinical disorders (American Psychiatric Association, 2014). Therefore, based on this frame of reference and all the evidence on the role of healthy habits in the psychological well-being of people (Arora and Grey, 2020; Bourke et al., 2022; Firth et al., 2020; WHO, 2021), the purpose of this study has been proposed.

### *Present study*

On the one hand, the negative effects that COVID-19 has had on people's mental health have become evident. On the other hand, the importance of working on lifestyle to prevent or treat mental problems has been proven. Moreover, different studies have demonstrated

the mediating role of healthy habits between different predictors and psychological well-being and distress. Consequently, the aim of this study was to examine the relations between psychosocial dysfunction during COVID-19, caused in the main areas of the person's development (i.e. subjective impact on physical state, emotional-psychological state, family coexistence, couple and friendship relationships, academic-work performance, economic stability, free time, and leisure), and bidimensional mental health, specifically life satisfaction, subjective well-being, and depression and anxiety symptoms. We also tested whether this relation was mediated by healthy habits, such that psychosocial dysfunction during COVID-19 was indirectly related with well-being/distress variables through health habits.

Based on previous literature, we expect to find a negative relation between psychosocial dysfunction during COVID-19 and well-being indicators ( $H_1$ ); and a positive relation between psychosocial dysfunction during COVID-19 and psychopathology symptoms ( $H_2$ ). In turn, healthy habits are expected to mediate these relations, being found to be negatively associated with psychosocial dysfunction during COVID-19 ( $H_3$ ) and with psychopathology symptoms ( $H_4$ ); and positively associated with well-being indicators ( $H_5$ ).

## Method

### Participants

An initial recruitment of 1020 participants was reached, although the following inclusion criteria were considered for this study: (a) acceptance of voluntary participation and consent to the use of the data; and (b) completion of all items of the scales. Consequently, the final sample consisted of 593 participants aged between 18 and 83 years ( $M=37.23$ ;  $SD=13.2$ ), of whom 72.5% ( $n=430$ ) were women. At the educational level, 27.7% ( $n=164$ ) of the sample had completed their degree studies; 22.8% ( $n=135$ ) had a master's degree, specialization, or university expert; 15.5% ( $n=92$ ) had a

doctorate; and the remaining 34.1% ( $n=202$ ) had completed their academic career after completing their baccalaureate or vocational training. With respect to the employment status of the participants, 30.7% ( $n=181$ ) were university or competitive examination students (to be public workers); 56.1% ( $n=331$ ) were active workers, whether full or part-time, self-employed, on scholarships, etc.; and 13.2% ( $n=78$ ) were inactive workers who were unemployed, affected by ERTE (Expediente de Regulación Temporal de Empleo (Temporary Labor Force Adjustment Plan), that is, reduction or suspension of work activity as a result of the Covid-19 pandemic), on sick leave or retired, among others.

The main objective of the project was to identify the needs of the university community to design action plans for the promotion of mental health and the prevention of psychological problems. Therefore, there was not necessarily an exact number of participants to be able to carry out the project. However, after stating the need to carry out this study, the sample size was determined by assigning several observations 6–10 times more than the variables (Velicer and Fava, 1998). Consequently, the required sample size ranged from 384 to 640 participants, considering the total number of items used in this study.

### Measures

**Sociodemographic variables.** Data were collected on *age* (>17 years) and *gender* (man/women/other), as well as *academic level* (according to the Spanish educational system) and *employment status* (students, active workers, inactive workers; or equivalent) at the start of the evaluation.

**Psychosocial dysfunctionality scale during COVID-19 (ad hoc).** This is a questionnaire designed to evaluate the degree of interference or subjective impact that the coronavirus health crisis, as well as the preventive measures of home confinement, has caused in the main areas of functional development of the person: physical

condition, emotional-psychological state, family coexistence, couple and friendship relations, academic-work performance, economic stability, free time, and leisure. It consists of nine items and a response scale ranging from 0 to 10 (0 = *No impact*; 5 = *Slight impact*; 10 = *Great impact*). It can be interpreted either as an overall subjective dysfunctionality score or individually by functional areas. The result of exploratory factor analysis for this ad hoc scale (EFA: principal axis factor analysis) showed that KMO=0.78 > 0.70, Bartlett's Test of Sphericity approximate chi-square value=1209 (36),  $p < 0.001$ , and the total explained variance was 28.4%. The model also showed adequate model fit for the unidimensional model indicating good structural validity ( $X^2/df=292/27$ , NNFI=0.70, and RMSEA=0.129, 90% CI=0.115, 142). The Cronbach's Alpha coefficient ( $\alpha$ ) was 0.76 and McDonalds' Omega ( $\Omega$ ) 0.77.

*Healthy Habits Questionnaire (ad hoc)*. This instrument is designed to evaluate the healthy behaviors developed during the period of home confinement and the gradual movement control ("de-escalation") derived from the coronavirus health crisis. It consists of a total of nine items formulated in positive, which refer to different aspects of physical, emotional, and social well-being: feeding, sleep, physical exercise, rest during study or work time, daily planning, entertainment, social contact, sexuality, hygiene, and personal care. The response options range from 0 to 10 depending on the degree of (dis)agreement with each item (0 = *Strongly disagree*; 10 = *Strongly agree*). This questionnaire allows a joint or individualized interpretation by items, such that the higher the score, the higher the adoption of healthy behaviors. The result of EFA for this ad hoc scale (principal axis factor analysis) showed that KMO=0.81 > 0.70, Bartlett's Test of Sphericity approximate chi-square value (df) = 973 (36),  $p < 0.001$ , and the total explained variance was 27.2%. The model also showed adequate model fit for the unidimensional model indicating good structural validity

( $X^2/df=143/27$ , NNFI=0.84 and RMSEA=0.085, 90% CI=0.072–0.099% CI). The  $\alpha$  was 0.75 and  $\Omega$  0.77.

*Life Satisfaction Scale (ad hoc)*. It consists of the self-reported evaluation of the degree of satisfaction with life in general on a graded 10-point scale (0 = *No satisfaction*; 10 = *A lot of satisfaction*).

*Well-Being Index (WHO-5; WHO, 1998)*. This is a brief questionnaire, widely used internationally, to explore subjective well-being through aspects related to positive mood, vitality, and general interest. It is composed of five items formulated in positive, which refer to how the person has felt during the last 2 weeks. It presents a Likert-type response scale to indicate the frequency with which each item has been experienced (0 = *Never*; 5 = *All the time*). It offers a total score ranging from 0 to 25. This instrument has been used in Spanish samples showing adequate psychometric properties (e.g. Lara-Cabrera et al., 2020). The  $\alpha$  was 0.91 and  $\Omega$  0.92.

*Patient Health Questionnaire Short-Form (PHQ-4; Kroenke et al., 2009)*. It is an ultra-brief instrument intended for the assessment and non-diagnostic screening of internalized psychopathology: depression and anxiety. It consists of a total of four items, two for each construct, derived from the original 9-item version of the PHQ (Kroenke et al., 2001, 2009) and the Generalized Anxiety Disorder Scale (GAD-7; Spitzer et al., 2006), respectively. It presents a Likert-type response scale that allows indicating the frequency with which the core symptoms of each problem are manifested (0 = *Never*; 1 = *Several days*; 2 = *More than half of the days*; 3 = *Almost every day*). This yields an overall measure of symptomatology and functional impairment, in addition to total values per factor ranging from 0 to 6 points. For this study, an adaptation of the content of the instructions was made to limit their reporting to the emergence of the COVID-19 health crisis and the

adoption of preventive measures in this regard, such as home confinement and/or gradual control of mobility (“de-escalation”). That is, instead of referring generically to symptomatology at any vital moment, it was specified that they refer to the symptomatology they felt since the pandemic state was decreed and throughout the confinement. The items remained the same and were not modified. Previous studies have shown this instrument to have high sensitivity, with cut-off points of three for each test (Muñoz-Navarro et al., 2017), and good psychometric properties (Cano-Vindel et al., 2018), with an  $\alpha=0.83$  and  $\Omega=0.90$ . These values are like those obtained in our study ( $\alpha/\Omega=0.87$ ).

*Social Emotional Health Survey – Higher Education and Adults (SEHS-HE; Furlong et al., 2017).* This instrument is designed for the self-reported assessment of socioemotional competencies in people over 18 years of age. Global measure Covitality alludes to the result of the interaction between all these socioemotional competencies and their synergistic effect on mental health. It is composed of a total of 36 items, and the response options are presented on a 6-point Likert-type scale, according to the degree of identification with the statements (1 = *Very uncharacteristic of me*; 6 = *Very characteristic of me*). The use of this measure for the Spanish university population has received support in a cross-cultural study with Spanish, Mexican, and Californian populations (Furlong et al., 2021).

## Procedure

The present study is part of the research *PSICO-RECURSOS COVID19: RECURSOS Y FORTALEZAS PSICOLÓGICAS SOS CONTRA EL COVID19*, promoted and developed by the Centre for Applied Psychology of the Department of Health Psychology of the institution of belonging. The aim of this initiative is to determine the psychological impact of the

COVID19 health crisis, emphasizing the influence of personal psychological resources such as resilience, coping strategies, socioemotional competencies, and healthy habits.

The study was aimed at the entire university community (students, Administration and Services Staff, and Teaching and Research Staff). Therefore, participants were recruited thanks to the mass dissemination of the survey through all university channels, that is, through communication services, social networks, and mass mailings. Data collection was carried out in self-report mode and through the Detecta-Web application (based on the LimeSurvey software). All participants signed an informed consent to participate and throughout the study process, voluntariness, anonymity, and confidentiality of the data were guaranteed. At the end of the self-assessment, an automated report was issued to the respondent with its main results and some recommendations established by the expert committee, as appropriate. The study was approved by the Ethics Committee of the institution to which they belonged.

*Construction of ad hoc measures.* To carry out the purpose of this study, three ad hoc measures were designed. First, all the surveys that had already been launched at that time on COVID-19 were reviewed. Some were searched in the databases of scientific journals and others were provided by colleagues. We then took note of all those aspects and variables that were considered relevant to this study.

More specifically, to design the Psychosocial dysfunctionality scale during COVID-19, the Echeburúa Interference Scale (Echeburúa et al., 2000) was used as a theoretical basis. Some of the items were modified and others were designed to be able to address all the specific areas of functioning. Among these areas, emotional-psychological interference was also asked about, but in a very generic way and referring to the COVID-19 situation. In this study it was taken as one more item to obtain a

global dysfunctionality score. Unlike this item, the variables measuring depression, anxiety and subjective well-being assess symptomatology in a much more specific way.

To design the Healthy Habits Questionnaire, official clinical guides, such as the WHO and the General Council of Psychology of Spain (Consejo General de la Psicología en España, 2020; WHO, 2021), were taken as a theoretical basis, which included recommendations to be considered during confinement, such as guidelines on diet, physical exercise, or sleep. A search was also made for instruments already published, but they were long and covered other areas that were not of interest. Consequently, an item was created for each of the variables measuring the healthy habits of interest, which were also agreed upon with experts.

Finally, regarding the Life Satisfaction Scale, it was decided to include a single item that would allow generic measurement of this variable, and at the same time avoid the final protocol being too long. This item had already been used in previous studies, demonstrating that it worked as well as a scale of 7–10 items (Galindez and Casas, 2010).

### Data analysis

According to recommended best practices by Worthington and Whittaker (2006), we used EFA on the entire dataset to assess the factor structure of the measures not previously validated, through the software JAMOV (The jamovi project, 2021). An EFA was performed for each scale using parallel analysis and scree plot using the Promax oblique rotation (estimation model: Minimum residual) for factor extraction. Goodness of fit was tested using the Non-Normed Fit Index (NNFI), with values above 0.90 considered acceptable. Residual statistics were tested using the root mean square error of approximation (RMSEA), with values less than 0.08 considered acceptable. Reliability evidence of study measures were examined by calculating  $\alpha$  and  $\Omega$ . A descriptive-correlational analysis was included for all the variables under study.

Then, a fully saturated path model was conducted using Mplus 8.4 (Muthén and Muthén, 2018) to test the aim of the present study, such that healthy habits was modeled as a mediator of indirect link between subjective interference and bi-dimensional mental health. Gender, age, and Covitality were entered as covariates. We examined direct, and indirect effects using bias-corrected bootstrapped estimates (Efron and Tibshirani, 1993) based on 10,000 bootstrapped samples, which provides a powerful test of mediation (Fritz and Mackinnon, 2007) and is robust to small departures from normality (Erceg-Hurn and Mirosevich, 2008). Statistical significance was determined by 95% bias-corrected bootstrapped confidence intervals not containing zero.

### Results

The results derived from descriptive and reliability analyses for each of the measures are summarized in Table 1. Overall, coefficients of internal consistency ( $\alpha$  and  $\Omega$ ) were above of 0.75, indicating evidence of reliability.

The bivariate correlations between the different variables can be seen in Table 2. Statistically significant and negative relations are shown between psychosocial dysfunction during COVID-19 and healthy habits, life satisfaction, subjective well-being, and socioemotional skills ( $p < 0.01$  and  $p < 0.001$ ). In contrast, positive relations are shown between psychosocial dysfunction during COVID-19 and symptoms of anxiety and depression ( $p < 0.001$ ). In turn, healthy habits are positively related to life satisfaction, subjective well-being, and socioemotional skills, and negatively related to symptoms of anxiety and depression ( $p < 0.001$ ). In general, all relations show small-moderate magnitudes of association.

Direct effects of the mediation model are summarized in Figure 1. A significant indirect effect via healthy habits were observed for satisfaction with life ( $\beta = -0.015$ , 95% CI  $(-0.035, -0.002)$ ), subjective well-being ( $\beta = -0.036$ , 95% CI  $(-0.059, -0.018)$ ), and depression

**Table 1.** Descriptive analyses and reliability indices for each study measures.

	Mean	SD	Range of scores	Cronbach's Alfa	McDonald's Omega
Health habits	56.20	15.6	0–90	0.75	0.77
Psychosocial dysfunction during COVID-19	49	16.7	0–90	0.76	0.77
Life satisfaction	7.31	1.76	0–10	–	–
Subjective well-being	13.9	5.59	0–25	0.91	0.92
Depression symptoms	1.78	1.54	0–6	0.82	0.82
Anxiety symptoms	1.47	1.55	0–6	0.83	0.83
Socioemotional skills	168.49	25.48	36–216	0.95	0.95

SD: standard deviation.

( $\beta=0.016$ , 95% CI (0.001, 0.037)), such that more subjective interference was associated with low healthy habits, which in turn were associated with less satisfaction with life, subjective well-being, and more depression. No significant indirect effects from psychosocial dysfunction to anxiety symptoms were observed ( $\beta=-0.003$ , 95% CI (-0.019, 0.014)). It is important to noted that, even accounting for socioemotional competences, as well age and sex, the mediated effects observed still significant.

## Discussion

The aim of this study was to analyze the relations between psychosocial dysfunction during COVID-19, caused in the main areas of the person's development and psychological well-being/discomfort (bidimensional mental health), specifically life satisfaction, subjective well-being, and depression and anxiety symptoms. At the same time, we also analyzed whether this relation was mediated by healthy habits, such that psychosocial dysfunction during COVID-19 was indirect related with well-being/discomfort variables through health habits. All this in a sample of Spaniards over 18 years of age.

Firstly, in both the correlational analysis and the mediation model, a negative relation was found between psychosocial dysfunction during COVID-19 and life satisfaction and subjective well-being ( $H_1$ ). Thus, in line with previous literature, those who have been negatively

impacted by COVID-19 are less satisfied with life in general, with a less positive mood, and with low vitality and general interest (Cheikh Ismail et al., 2020; Dragun et al., 2020; Every-Palmer et al., 2020; Vindegaard and Benros, 2020; Zacher and Rudolph, 2021). In turn, this psychosocial dysfunction has been positively related to depression and anxiety symptoms, such that individuals who have perceived such negative impact by COVID-19 show greater anxious and depressive symptomatology ( $H_2$ ) (Zhang et al., 2022; Ettman et al., 2020; Santabarbara et al., 2021; Schou et al., 2021; Xiong et al., 2020).

Secondly, the mediating role of healthy habits has been tested in three of the above relations. Healthy eating, sleeping, and physical exercise habits, rest during study or workdays, daily planning, leisure activities, social contact, hygiene, sexuality, and self-care seem to mediate the relations between psychosocial dysfunction during COVID-19 and life satisfaction, subjective well-being, and depressive symptomatology ( $H_3$ ,  $H_4$ , and  $H_5$ ). Thus, those negatively impacted by the virus had less healthy habits ( $H_3$ ) (e.g. Alhusseini and Alqahtani, 2020; Bakhsh et al., 2021; Cheikh Ismail et al., 2020; González-Monroy et al., 2021; Jahrami et al., 2022; Martínez-de-Quel et al., 2021; Santos-Miranda et al., 2021; Stockwell et al., 2021). In turn, this has led to lower life satisfaction and subjective well-being ( $H_4$ ), and greater depressive symptomatology ( $H_5$ ). These results are in line with previous literature, as the positive association between having healthy habits

**Table 2.** Association between the variables under study.

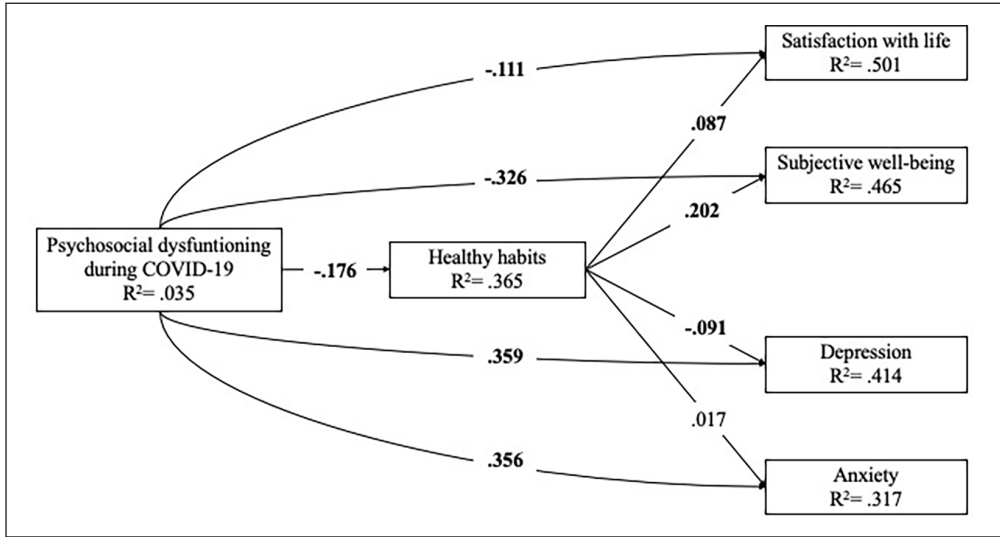
	1.	2.	3.	4.	5.	6.	7.	8.
Psychosocial dysfunction during COVID-19	1							
Health habits	-0.237***	1						
Life satisfaction	-0.264***	0.444***	1					
Subjective well-being	-0.440***	0.505***	0.580***	1				
Depression symptoms	0.468***	-0.353***	-0.547***	-0.659***	1			
Anxiety symptoms	0.427***	-0.247***	-0.389***	-0.548***	0.700***	1		
Gender	0.070*	-0.024	-0.079	-0.113***	0.144***	0.156***	1	
Age	-0.170***	0.097**	0.189***	0.220***	-0.342***	-0.275***	-0.164***	1
Socioemotional skills	-0.116**	0.564***	0.643***	0.531***	-0.431***	-0.365***	0.012	0.191***

n=593; \*p < 0.05, \*\*p < 0.01, \*\*\*p < 0.001. Gender was code as 0=Man and 1 =Women.

and better well-being and quality of life (H<sub>4</sub>), and negatively with depression and anxiety symptoms (H<sub>5</sub>) was proven (Dragun et al., 2020; González-Sanguino et al., 2020; Martinsen, 2008; Redeker et al., 2018; Trigueros et al., 2020; Twenge and Campbell, 2018).

As in previous studies, the importance of healthy lifestyle habits for increasing psychological well-being and decreasing psychological distress is evident (Božek et al., 2020; Tada, 2017; Wittmann et al., 2010). Its mediating role during COVID-19 confinement between different predictors and psychological well-being or distress is also evidenced (Corbí et al., 2021; Del Líbano et al., 2021; Sousa et al., 2021). In this work, the effects of psychosocial dysfunction during COVID-19 on well-being and distress appear to be mediated by healthy habits. However, in the case of distress, only for depressive symptomatology, not mediating the effect on anxious symptomatology, contrary to expectations (e.g. Zhang et al., 2022; Schou et al., 2021). Therefore, H<sub>4</sub> is only partially fulfilled.

Taking into account these contributions, the need to take into consideration healthy habits to mitigate the negative effects caused by COVID-19 and to take them into account when designing action plans that complement more traditional interventions is evident (Przybylko et al., 2021; Ransing et al., 2020; United Nations Children’s Fund, 2020). In relation to this, mental health professionals continue to investigate how to improve intervention techniques to alleviate mental problems. Thus, different studies have demonstrated the efficacy of new interventions as a complement to traditional therapies, such as internet-based interventions (Lattie et al., 2019), smartphone-based interventions (Firth et al., 2017) or meditation-based interventions (mind-body interventions) Other authors go further and recommend creating interventions that merge the disciplines of positive psychology and lifestyle medicine; placing particular emphasis on the use of such interventions for mental problems resulting from the mental health crisis caused by COVID-19 (Przybylko et al., 2021). Related to this, some professionals



**Figure 1.** Psychosocial dysfunction during the COVID-19 pandemic and bidimensional mental health: the mediating role of healthy habits.

Significant associations are in boldface for emphasis and were determined by a 95% bias-corrected standardized bootstrapped confidence interval (based on 10,000 bootstrapped samples) that does not contain zero. Effects from covariates (gender, age, and socioemotional competence) are omitted for parsimony.

have designed pandemic-specific mental health action plans (e.g. Ransing et al., 2020).

It is also important to note that the DSM-5 Diagnostic Criteria Reference Guide (Diagnostic Manual of Mental Disorders, Fifth Edition) includes interference as one of its mandatory criteria common to all clinical disorders, so in this study special emphasis was placed on analyzing the interference caused by COVID-19 on people's well-being. As the results have shown, people who have experienced the COVID-19 pandemic as a negative experience consider that they have less psychological well-being, which denotes the importance of analyzing the degree of subjective interference that people feel when diagnosing any type of psychological symptomatology, as indicated by the DSM-5 (American Psychiatric Association, 2014).

### Limitations and future lines of research

Among the main limitations of this study are those related to the cross-sectional design and the type of sampling used. Since this is a convenience sampling and a cross-sectional, the

generalizability of the results and the causality of the relations cannot be assured. Although they are not longitudinal relations, the results are in line with previous studies (Corbí et al., 2021; Del Libano et al., 2021; Sousa et al., 2021). Therefore, it would be necessary to analyze these relations longitudinally to provide more evidence for the results obtained in this study.

Another limitation of the study that hinders the generalizability of the results is the high percentage of participants in the study sample who identify themselves as women. Future studies should be based on a more representative sample with a similar percentage of people identifying as male and female. However, the special circumstances of the declaration of the global COVID-19 pandemic and the generalized confinement in Spain from March to May 2020 determined how participants were recruited and the sampling performed in this study.

Finally, a third limitation is related to the measures used in the study, as three of the scales were designed specifically for this project, making it difficult to guarantee their psychometric properties. Future studies should provide further evidence of psychometric properties for them.

## Conclusion

COVID-19 has had a significant negative impact on people's mental health. Following the restrictions imposed by the government to curb the spread of the virus, many people have changed their lifestyles, which in turn has led to reduced subjective well-being and satisfaction with their lives and increased anxious-depressive symptoms. Maintaining healthy habits during the pandemic has been shown to mitigate all these negative consequences. This study shows its mediating role between psychosocial dysfunction during COVID-19 and subjective well-being and distress. Therefore, it is clear that programs promoting healthy behaviors should be implemented, especially targeting those known to be the most vulnerable, that is, healthcare workers, people with physical or mental problems, people with financial problems, children and the elderly (Hernández and Hernández, 2020; Tsamakís et al., 2021; Uphoff et al., 2021). In general, it is important to consider the psychosocial dysfunction generated by the psychological problems and the need to include psychosocial interventions in psychological treatments (Redondo de Freitas, 2018; WHO, 2003).

## Author contributions

Pilar Rico-Bordera: writing-original draft; Raquel Falcó: data curation, methodology, conceptualization, writing-review, and editing; Verónica Vidal-Arenas: formal analysis, methodology, conceptualization, writing-review, and editing; José Antonio Piqueras: project administration, supervision, conceptualization, writing-review and editing; PSICO-RECURSOS: investigation.

## Data Sharing Statement

Database, syntax, outcomes and evaluation protocol are available upon reasonable request to the corresponding author.

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## ORCID iDs

Pilar Rico-Bordera  <https://orcid.org/0000-0002-2157-2468>

Raquel Falcó  <https://orcid.org/0000-0003-1426-5934>

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