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ORIGINAL ARTICLE

Effectiveness of Two Mobile Apps in Promoting Mental Health among University Students

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Abstract

Background: There is evidence of a high prevalence of depression, anxiety, mental health and difficulties in university students. Currently, the many mindfulness meditation and emotion management interventions delivered via a mobile app may be an appealing, effective way to reduce stress in college students.

Objective: To evaluate the effectiveness of two mobile app interventions compared to a wait-list control in promoting health, resilience, mindfulness, emotion management and coping skills in first year university students enrolled in Health Sciences degree courses.

Methods: The study design was a sample of 154 first-year undergraduates with a mean age of 19.82 years were assigned to one of three conditions: 1) unguided Internet-based mindfulness intervention app "Calm"; 2) unguided emotion management app "E-Trainer"; and 3) wait-list control condition. Participants were evaluated at pre-treatment and 7 months follow-up (post-treatment). For this purpose, we used the General Health Questionnaire-28 (GHQ-28), the Patient Health Questionnaire (PHQ-15), the short form of the State Trait Anxiety Inventory (STAI), the Five-Facet Mindfulness Questionnaire-Short Form (FFMQ-SF), the Connor-Davidson Resilience Scale (CD-RISC) and the Evaluation of the Need for Psychological Assistance Questionnaire (NPAQ).

Results: There were no significant differences in any outcomes between the interventions and control groups. We identified one significant difference as regards whether they needed psychological assistance from the university at post-test. However, only 53 students completed the study (17 "Calm", 26 "E-Trainer", 10 controls). We analysed the 101 students that dropped out and did not continue to the post-test, comparing them with those that remained. We found that those continuing felt concern about their somatic symptoms, their study methods, and their academic performance. Additionally, the results of paired-sample pre-test-post-test measures showed these students presented higher levels of distress, anxiety, academic and interpersonal dysfunctions.

Conclusions: Although the mobile app interventions were not effective, our study was able to determine the status of the students that completed the study, with post-test being when they presented most difficulties. Thus, in the case of these students, early strategies are needed for the prevention and treatment of psychological effects on the mental health of university students.

Keywords

Mental health, University students, First year, Mobile phone, Effectiveness

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Introduction

For young people, the years at university coincide with a transitional period of emerging adulthood. Students attending university have to adjust to a new learning context and are under increased academic pressure [1], and for some, it poses a great risk to their psychological well-being [2].

This is considered one of the life cycle stages with the greatest levels of anxiety, with high levels of psychological distress compared with the general population and lower levels of psychological well-being in university students [2-5]. It is estimated that between 12% and 50%of all university students are affected by mental health problems [2,3,4,6,7].

To help students navigate this transitional period of their life and equip them with skills relevant for and beyond university life, it is vital to develop preventive and therapeutic interventions that are easily accessible, many studies [1,3,4,6,8] highlight the importance of developing systemic competencies that include inter- and intra-personal psychological resources, such as self-esteem, self-concept, social skills, social responsibility, socially responsible attitudes, problem solving and learning style preferences, suitable levels of empathy, resilience, emotional intelligence and emotion regulation.

In this sense, mindfulness-based approaches are effective in reducing the effects of stress on university students, including reducing levels of stress, cortisol response, anxiety, depression, mental health problems, self-harming behaviours and even suicide [9-13]. These approaches have emerged as a major priority for universities and colleges, because helping students to stay calm, be relaxed, manage their emotions and focus on the present moment increases self-awareness and prevents behaviours such as rumination, worrying, anxiety, emotional distress, etc. [8,9,14,15].

Mindfulness meditation is the practice of moment-to-moment awareness in which the person purposefully focuses on the present without judgement. It explores how the mind influences the body and how the body influences the mind (i.e. objective observation of physical sensations in the body). The goal is to sharpen concentration, maintain a version [10,11].

However, only 1 in 5 university students with mental disorders receives minimally adequate treatment. Reasons for this treatment gap include attitudinal barriers such as stigma, cost-effective, long waiting lines and a preference for self-help [2,7].

Online mental health services may provide a solution to these issues of access and quality. Internet-and mobile-based interventions might help to increase the utilization of psychological interventions, as they can be easily accessed, allow for high scalability, and can beprovided at a low cost [6,15].

The current massive use of the Internet and mobile phones, with myriad utilities, has led to the emergence of a variety of mobile applications for many problems, needs and circumstances. For example, mental health care apps have appeared that can play an important role in the assessment, prediction, and monitoring of mental health, as well as psycho education delivery, self-management strategies, recovery support, prevention, and promotion. In addition, apps can be used for the training of mental health providers [2,6,7,15-17].

The objective of the study is to test the effectiveness of two mobile app preventive programs (Calm and E-Trainer) in promoting health, resilience, and mindfulness, manage emotions and coping skills among first-year university students studying for Health Science degrees compared to a wait-list control group. The hypotheses are that the E-trainer and Calm programs will improve the emotion management, resilience, coping skills, and psychological well-being of the undergraduates. In addition, E-Trainer and Calm are expected to be more effective than the wait-list control group, but with greater and statistically significant effects of E-Trainer as an intervention that targets the fostering of resilience and management of emotions.

Methods

Study design

This research was a three-armed, single blind, randomized controlled trial (RCT) with repeated measurements at two points in time (at baseline or pre-test and post-intervention 7 months later or post-test) conducted with university students in Spain. The students were studying the first year of degree courses in Speech and Language Therapy, Nursing, Occupational Therapy, Podiatry and Podiatry + Nursing.

Due to the nature of the study, the participants were informed of the condition or intervention they were assigned to. After they had completed baseline assessments, a research team member (unblinded) allocated participants to one of the groups using the randomization list. The study staff and participants were unblinded to group allocation. The participants were randomized to one of the three interventions in a 1:1:1 ratio: 1) unguided Internet-based mindfulness intervention app “Calm”; 2) unguided emotional management app “E-Trainer”; and 3) wait-list control (WLC).

Participants

The target population was first-year undergraduates enrolled in different degrees at the university. At baseline, this population comprised 154 (73%) students of a total of 211 undergraduates enrolled for the first year. Finally, at post-test, the sample included 53 students (Table 1).

Table 1: Sociodemographic data.

	Pretest	Posttest
	(n = 154)	(n = 53)
Age (media, SD)	19.82 (3.83)	19.42 (1.96)
Median, Range	19 (17-47)	19 (17-25)
Younger (17-19) (n, %)	93 (60.38)	34 (64.02)
Older (20-47) (n, %)	61 (39.61)	19 (35.08)
Gender (n, %)		
Male	21 (13.6)	4 (7.5)
Female	133 (86.4)	49 (92.5)
Interventions (n, %)		
App Calm	38 (24.7)	17 (32.1)
App E-Trainer	59 (38.3)	26 (49.1)
Control Group	57 (36.8)	10 (18.8)

Instruments

An anonymous on-line questionnaire was developed for this study. First, background demographic information consisting of gender, age, and degree course was collected.

Second, we administered the General Health Questionnaire-28 (GHQ-28), which was developed by Goldberg in 1978 [18]. The GHQ-28 is one of the most widely used and validated questionnaires to screen for emotional distress, to detect those likely to have been, or to be, at risk of developing psychiatric disorders and possible psychiatric morbidity. It has been tested in numerous populations and has since been translated into 38 languages. The GHQ-28 is a 28-item measure of emotional distress in the last few weeks and is therefore an indication of state rather than trait characteristics at a point in time. Through factor analysis, the GHQ-28 has been divided into four subscales: somatic symptoms (items 1-7); anxiety/insomnia (items 8-14); social dysfunction (items 15-21), and severe depression (items 22-28). Answers on the GHQ are coded on a 4-point Likert scale (0-1-2-3) or on a dichotomous GHQ scale (0-0-1-1). We used the GHQ scale where the GHQ-28 can be scored with a binary method where “not at all”, and “no more than usual” score 0, and “rather more than usual” and “much more than usual” score 1. Using this method, any score above 4 indicates the presence of distress or ‘caseness’. The Cronbach’s α is excellent (0.9-0.95). The Spanish-language version of the GHQ-28 by Lobo and Muñoz [19], which has good psychometric properties (Cronbach’s α 0.90), was used for this study.

Third, we administered the Patient Health Questionnaire PHQ-15, developed by Kroenke, et al. [20]. It is a self-administered test on somatic symptoms in the last seven days. The PHQ-15 comprises 15 somatic symptoms, each scored from 0 ("not bothered at all") to 2 ("bothered a lot"). The total PHQ-15 score ranges from 0 to 30 and scores of ≥ 5, ≥ 10, ≥ 15 represent mild, moderate, and severe levels of somatization. The Cronbach’s α is 0.8. For this research, we used the Spanish version of the PHQ-15 by Ros Montalbán, et al. [21], which has adequate psychometric properties (Cronbach’s α 0.78).

Fourth, the State-Trait Anxiety Inventory (STAI) questionnaire was used [22]. These authors were the first to assess trait anxiety and state anxiety, using a brief 6-item version of the original STAI (Spielberger, 1983), obtaining good psychometric properties and a consistent structure (α = 0.80 in state anxiety and α = 0.88 in trait anxiety). This version comprised six items per scale with a minimum score of 0 and a maximum of 18. The items used were state anxiety items 2, 4, 11, 15, 17 and 18, and trait anxiety items 7, 14, 15, 16, 17 and 18. The answers included 4 alternatives (scored from 0 to 3). This short version has been shown to have good validity in university population [23].

Fifth, we administered the Five-Facet Mindfulness Questionnaire-Short Form (FFMQ-SF) by Bohlmeijer, et al. [24]. The FFMQ-SF is a 24-item questionnaire that measures the five facets of mindfulness: observing one’s reaction (observing), ability to describe this reaction (describing), acting with awareness, non-judging of inner experience (non-judging), and non-reacting to inner experience (non-reacting). Each subscale is made up of 5 items, except for observing, which has 4. Responses are rated on a 5-point Likert scale ranging from 1 (never or rarely true) to 5 (very often or always true). The minimum score is 24 points and the maximum is 120 points, and higher scores thus indicate a higher level of mindfulness. The Cronbach’s α is good (0.88). The items from the Spanish adaptation were used [25].

Sixth, we used the Connor-Davidson Resilience Scale (CD-RISC) [26], in its Spanish adaptation by Notario-Pacheco, et al. [27], which comprises 10 items. In this scale, the participants are asked to indicate their level of agreement with each of the statements they are shown. The items are scored on a 5-point Likert-type scale, from (strongly disagree) to 4 (strongly agree). The scores for each item are summed and interpreted, such that the higher the score, the greater is an individual’s resilience. The Cronbach’s alpha was 0.89.

Seventh, we administered the Evaluation of the Need for Psychological Assistance Questionnaire (NPAQ) [28]. This consists of 12 items evaluating the distress of university students in three areas: academic performance (items 1-4), interpersonal relationships (items 5-8) and emotional state (items 9-12). Each item is scored from “nothing” (0) to “a lot” (4). The sum offers a total score for each scale. Higher values are indicative of greater difficulty/distress. The NPAQ also explores interest in receiving psychological care (yes/no) in relation to each of the conditions evaluated and to 10 healthy habits (food, sleep, physical exercise, free time, sexual relationships, alcohol consumption, tobacco, other substances, social networks and gambling). The values of internal consistency of the test were between

moderate and high, with a Cronbach's alpha of 0.83 for the total score, α = 0.65 for the academic achievement scale, α = 0.81 for the interpersonal relationships scale, and α = 0.70 for emotional distress.

Finally, we asked about the presence of the following emotions (fear, anger, guilt, disgust, sadness, surprise, curiosity, admiration, security, and joy) [29,30] in recent weeks. Subjects chose only the one emotion that had beenmost present in the last weeks.

The study was explained to all the participants, who signed an informed consent form.

Interventions

App calm: After participants completed baseline assessments and after randomization, a research team member went to a classroom to inform and instruct the "Calm" intervention group on the Calm mobile app and how to download it. Calm is a consumer-based mindfulness meditation mobile app that offers a range of mindfulness meditation practice guide modulesvarying in length, instruction, and content. The Center for Humane Technology designed the "Calm" app to be the "happiest app in the world'. It was chosen as App of the Year by Apple in 2017. Additionally, Hubety, et al. [11] reported highly significant results for the use of this application among university students.

This app is free to download, although certain features that can be used to delve deeper into mediation require payment, it can be downloaded on any Android or IOS operating system. Participants can meditate using the guided meditations or may choose from a number of programs offering multiday meditations specific to goals (e.g., happiness or self-esteem). Calm also offers other individual guided and unguided meditations (e.g., a brief introductory guidance followed by a chosen period of silence or sounds from nature). This goal of the app is the practice of moment-to-moment awareness, in which the person purposefully focuses on the present without judgement. Once downloaded, the participants were able to use the "Calm" app whenever they wanted or needed to, with it being important that they used it. Nonetheless, throughout the research, participants received several emails reminding them of the importance of using the "Calm" app whenever they wanted or needed to use it. After the intervention, participants continued to have access to the app and could use it at their own leisure or as needed.

Participants in this intervention were evaluated 7 months later at the post-intervention moment.

App E-Trainer: After participants completed baseline assessments and after randomization, a research team member went to a classroom to inform and instruct the "E-Trainer" group on the app and how to download it. E-Trainer was designed by Emotional Network, which is based on the emotional intelligence model of "Conscious Emotional Link" (VEC, in its Spanish acronym) (https://emotional.net/etrainer). The aim is to achieve emotional training to help manage emotions, allowing a maladaptive emotion to be replaced by an appropriate one. This app can be downloaded on any Android or IOS operating system.

This app is not free although Emotional Network provided a download code. A research team member explained how to download the app using the code provided. With this code, participants were able to download the app and use it as often as they wanted or needed. However, throughout the research, participants received several emails reminding them of the importance of using the "E-Trainer" app whenever they wanted or needed it. After the intervention, participants continued to have access to E-Trainer and could use it at their own leisure or as needed.

This intervention was assessed 7 mounts later, at the post intervention moment.

Wait-List Control Group: Participants assigned to the Wait-List Control condition were evaluated and monitored prior to the beginning of the intervention and, subsequently, at 7 months.

Procedure

The sampling process was carried out with the collaboration of the academic secretary's office of the faculty of Health Sciences, which sent an email to the first-year students in all the Health Science degree courses, explaining the aim of this study and including a link to respond to the questionnaire (Google Forms®).

The first online questionnaire was openly accessible for 14 days from 5 to 19 October 2023 and the second online questionnaire for 14 days from 5 to 19 May 2024. Informed consent was obtained electronically before data were collected from the participants on both questionnaires.

This study was approved and supervised by the Research Ethics Commission of the Talavera de la Reina Integrated Health Service Management in Talavera de la Reina, Toledo, Spain (11/2020).

Data analysis

The analysis of the data was conducted using the IBM® SPSS® Statistics 24.0 computer program. For the statistical analysis, we first checked whether the variables to be statistically analysed followed a distribution of normality, using the K-S test for normality. The sample does not follow a normal distribution of data as indicated by the analysis of the Kolmogorov-Smirnov test of normality, in which all the variables evaluated present a probability of less than or equal to 0.05. Therefore, for the analysis of the data, the parametric Student's t and chi-square tests were used. Pre- and post-intervention analyses were carried out by performing a paired-samples t test. Differences in baseline and post-intervention were analysed using

inter- and intra-group tests, Student's t test, and the chi-square test. A confidence level of 0.05 and 0.01 was taken into account for all statistical analyses. In addition, descriptive and frequency distribution analyses (mainly, means and standard deviations) were performed.

The analysis of missing data from the sample was carried out with multiple imputation in the analysis (expectation maximization and regression method), with Little's chi-square statistic 23.063 (degree freedom = 30; p = 0.813).

The investigator who performed the statistical analysis was unaware of the random assignment of participants to the intervention groups.

Results

Mean scores for pre-test and post-test samples

Table 2 shows the mean scores on the questionnaires used in this study at pre-test and post-test.

Statistically significant differences between groups

Since the final sample at post-intervention comprised 53 subjects (34.41%), accounting for the loss of 101 participants (65.59%) that did not continue in the study, we decided to explore what occurred for them to drop out. It is of interest to know what happened to these students who did not continue in the study because of the high number of experimental subjects we lost, which may provide information as to why this occurs. These results can be seen in Table 3.

Thus, when comparing the dropouts (N = 101) with those who continued (N = 53), three statistically significant differences were found in the PHQ-15 total score and in the NPAQ items related to study method and academic performance, where the continuers were more concerned about their somatic symptoms, as well as about improvements in their study methods and academic performance.

Table 2: Descriptive statistics in questionnaire measures at both moments.

	PRETEST (n = 154)			**POSTEST** (n = 53)		
SCALES	**M (SD)**	**Min**	**Max**	**M (SD)**	**Min**	**Max**
GHQ-28: Somatic symptoms	1.64 (1.87)	0	7	2.71 (2.34)	0	7
GHQ-28: Anxiety and insomnia	2.28 (2.39)	0	7	3.37 (2.52)	0	7
GHQ-28: Social dysfunction	1.81 (1.78)	0	6	2.41 (2.05)	0	7
GHQ-28: Severe depression	0.7 (1.28)	0	7	1.03 (1.56)	0	7
GHQ-28	6.44 (5.94)	0	26	9.54 (6.89)	0	27
PHQ-15	8.3 (5.18)	0	22	10.96 (5.71)	0	27
STAI-S	6.73 (1.95)	0	12	6.90 (1.77)	3	12
STAI-T	7.56 (2.74)	1	15	8.20 (1.80)	3	14
FFMQ-SF: Observe	12.82 (3.76)	4	20	11.88 (4.64)	4	20
FFMQ-SF: Describe	14.24 (2.66)	7	22	13.81 (2.75)	9	20
FFMQ-SF: act with awareness	10.99 (3.86)	5	21	11.28 (4.44)	5	20
FFMQ-SF: Non-judging	14.53 (4.73)	5	25	14.54 (5.12)	5	25
FFMQ-SF: Non-reacting	12.70 (3.85)	5	24	11.73 (4.37)	4	24
FFMQ-SF	65.30 (12.23)	37	106	64.45(14.48)	36	100
CD-RISC	24.85 (7.69)	0	40	26.05 (6.41)	7	40
NPAQ: Academic conditions	7.72 (3.75)	0	16	8.37 (3.75)	1	16
NPAQ: Interpersonal relationships	5.32 (3.43)	0	16	5.81 (4.25)	0	16
NPAQ: Emotional state	5.27 (3.95)	0	16	6.69 (4.52)	0	16
NPAQ	18.25 (9.24)	1	45	20.88 (11.06)	4	48
	Pretest (n = 154)			**Postest** (n = 53)		
Would you request psychological care with regard to academic conditions, interpersonal relationships and emotional state? (yes)	**(n, %)**			**(n, %)**		
Study Method	100 (64.9)			34 (64.2)		
Academic performance	75 (48.7)			29 (54.7)		
Work overload	82 (53.2)			37 (69.8)		
Fear of speaking in public	95 (61.7)			31 (58.5)		
Peer relationships	67 (43.5)			28 (52.8)		
Requesting help	102 (66.2)			32 (60.4)		
Expressing opinions/emotions	82 (53.2)			23 (43.4)		
Family relationships	60 (39)			24 (45.3)		
Stress/Physical discomfort	55 (35.7)			28 (52.8)		
Distancing oneself from personal problems	100 (64.9)			34 (64.2)		
Inability to face the future	79 (51.3)			27 (50.9)		
Abandonment of important activities	66 (42.9)			36 (67.9)		

	Pretest (n = 154)			**Postest** (n = 53)		
Would you request psychological care and help in healthy habits?(yes)	**(n, %)**			**(n, %)**		
Food	64 (41.6)			25 (47.2)		
Sleep	73 (47.4)			28 (52.8)		
Exercise	70 (45.5)			23 (43.4)		
Free time	51 (33.1)			22 (41.5)		
Sexual relationships	46 (29.9)			13 (24.5)		
Alcohol	38 (24.7)			16 (30.2)		
Smoking	34 (22.1)			14 (26.6)		
Addictive substances	31 (20.1)			15 (28.3)		
Social networks	49 (31.8)			20 (37.7)		
Gambling	36 (23.4)			16 (30.2)		
	Pretest (n = 154)			**Postest** (n = 53)		
Would you go to the university'spsychological assistance service?	**(n, %)**			**(n, %)**		
Yes	127 (82.5)			44 (83)		
No	27 (17.5)			9 (17)		
	Postest (n = 154)			**Postest** (n = 53)		
Utility of psychological assistance	**M (SD)**	**Min**	**Max**	**M (SD)**	**Min**	**Max**
	7.72 (2,4)	0	10	6.37 (2.8)	0	10
	Postest (n = 154)			**Postest** (n = 53)		
Emotions	**(n, %)**			**(n, %)**		
Fear	18 (11.7)			8 (15.1)		
Anger	9 (5.8)			13 (24.5)		
Disgust	2 (1.3)			1 (1.9)		
Guilt	8 (5.2)			2 (3.8)		
Sadness	26 (16.9)			11 (20.8)		
Surprise	5 (3.2)			1 (1.9)		
Curiosity	37 (24)			5 (9.4)		
Admiration	2 (1.3)			1 (1.9)		
Security	11 (7.1)			2 (3.8)		
Joy	36 (23.4)			9 (17)		
Pleasant	86 (55.8)			17 (32.1)		
Unpleasant	68 (44.1)			36 (68)		

Table 3: Significant differences were found between students that continued and those that dropped out. Mean ranges.

	Dropped out (n = 101)			**Continued** (n = 53)				
Scales	**M (SD)**	**Min**	**Max**	**M (SD)**	**Min**	**Max**	**t**	***p***
GHQ-28: Somatic symptoms	1.60 (1.77)	0	7	1.73 (2.07)	0	7		
GHQ-28: Anxiety and insomnia	2.33 (2.44)	0	7	2.18 (2.32)	0	7		
GHQ-28: Social dysfunction	1.78 (1.75)	0	6	1.86 (1.87)	0	6		
GHQ-28: Severe depression	0.7 (1.22)	0	7	0.69 (1.39)	0	6		
GHQ-28	6.42 (5.65)	0	26	6.49 (6.52)	0	26		
PHQ-15	7.67 (5.12)	0	19	9.50 (5.71)	0	22	2.113	≤ 0.036
STAI-S	6.67 (2.06)	0	12	6.84 (1.74)	2	10		
STAI-T	7.45 (2.71)	3	15	7.77 (2.82)	1	14		
FFMQ-SF: Observe	12.72 (3.86)	4	20	13.05 (3.61)	6	20		
FFMQ-SF: Describe	14.34 (2.13)	7	22	14.20 (2.59)	8	19		
FFMQ-SF: act with awareness	10.96 (3.92)	5	20	11.05 (3.45)	5	19		
FFMQ-SF: Non-judging	14.21 (4.64)	5	25	15.16 (4.73)	5	25		
FFMQ-SF: Non-reacting	12.70 (3.65)	5	21	12.60 (3.83)	5	21		
FFMQ-SF	61.03 (15.99)	32	106	66.09 (10.65)	37	80		
CD-RISC	24.41 (7.58)	0	37	25.69 (7.91)	3	40		
NPAQ: Academic conditions	7.52 (3.62)	0	16	8.09 (3.99)	1	16		
NPAQ: Interpersonal relationships	5.33 (3.22)	0	15	5.35 (3.85)	0	16		
NPAQ: Emotional state	5.27 (3.98)	0	16	5.28 (3.92)	0	16		
NPAQ	18.04 (8.93)	1	45	18.67 (9.89)	4	42		

	Dropped out (n = 101)			**Continued** (n = 53)				
Would you request psychological care with regard to academic conditions, interpersonal relationships and emotional state? (yes)	**(n, %)**			**(n, %)**	**χ^2**	***p***		
Study Method	60 (59.4)			40 (75.5)	3.940	≤ 0.047		
Academic performance	43 (42.6)			32 (60.4)	4.410	≤ 0.036		
Work overload	56 (55.4)			26 (49.1)				
Fear of speaking in public	64 (38.6)			31 (58.5)				
Peer relationships	39 (38.6)			28 (52.8)				
Requesting help	64 (63.4)			38 (71.7)				
Expressing opinions/emotions	52 (51.5)			30 (56.6)				
Family relationships	37 (36.6)			23 (43.4)				
Stress/Physical discomfort	35 (34.7)			20 (37.7)				
Distancing oneself from personal problems	68 (67.3)			32 (60.4)				
Inability to face the future	50 (49.5)			29 (54.7)				
Abandonment of important activities	38 (37.6)			28 (52.8)				
	Dropped out (n = 101)			**Continued** (n = 53)				
Would you request psychological care and help in healthy habits? (yes)	**(n, %)**			**(n, %)**				
Food	40 (39.6)			24 (45.3)				
Sleep	48 (47.5)			25 (47.2)				
Exercise	47 (46.5)			23 (43.4)				
Free time	35 (34.7)			16 (30.2)				
Sexual relationships	28 (27.7)			18 (34)				
Alcohol	22 (21.8)			16 (30.2)				
Smoking	21 (20.8)			13 (24.5)				
Addictive substances	17 (16.8)			14 (26.4)				
Social networks	34 (33.7)			15 (28.3)				
Gambling	21 (20.8)			15 (28.3)				
	Dropped out (n = 101)			**Continued** (n = 53)				
Would you go to the university's psychological assistance service?	**(n, %)**			**(n, %)**				
Yes	87 (86.1)			40 (75.5)				
No	14 (13.9)			13 (24.5)				
	Dropped out (n = 101)			**Continued** (n = 53)				
Utility psychological assistance	**M (SD)**	**Min**	**Max**	**M (SD)**	**Min**	**Max**		
	7.51 (2.62)	0	10	8.11 (1.84)	2	10		
	Dropped out (n = 101)			**Continued** (n = 53)				
Emotions	**(n, %)**			**(n, %)**				
Fear	10 (9.9)			8 (15.1)				
Anger	5 (5)			4 (7.5)				
Disgust	2 (2)							
Guilt	3 (3)			5 (9.4)				
Sadness	17 (16.8)			9 (17)				
Surprise	3 (3)			2 (3.8)				
Curiosity	29 (28.7)			8 (15.1)				
Admiration	2 (2)							
Security	7 (6.9)			4 (7.5)				
Joy	23 (22.8)			13 (24.6)				
Pleasant	61 (60.3)			25 (47.2)				
Unpleasant	40 (39.7)			28 (52.8)				

Note: $^{*}p < 0.05$; $^{**}p < 0.001$

Table 4: Descriptive statistics on the frequency of use of the interventions and their utility.

Frequency of app use (n = 53)	**(n, %)**
Once a week	1 (1.9)
Every 15 days	1 (1.9)
Once a month	3 (5.7)
When I remembered	9 (17)
When I felt bad	8 (15.1)
Never	31 (58.5)
Utility(n = 53)	**(n, %)**
Yes	19 (35.8)
No	34 (64.2)

Table 5: Paired-sample pre-test-post-test repeated measures.

N = 53			**Pretest**	**Postest**
SCALES	**t**	***p***	**M (SD)**	**M (SD)**
GHQ-28: Somatic symptoms PRE-GHQ-28: Somatic symptoms POST	-3.013	≤ 0.004	1.73 (2.07)	2.71 (2.34)
GHQ-28: Anxiety and insomnia PRE-GHQ-28: Anxiety and insomnia POST	-3.468	≤ 0.001	2.18 (2.32)	3.37 (2.52)
GHQ-28: Social dysfunction PRE-GHQ-28: Social dysfunction POST	-2.163	≤ 0.035	1.86 (1.87)	2.41 (2.05)
GHQ-28: Severe depression PRE-GHQ-28: Severe depression POST				
GHQ-28 PRE-GHQ-28 POST	-3.475	≤ 0.001	6.49 (6.52)	9.54 (6.89)
PHQ-15 PRE-PHQ-15 POST	-2.164	≤ 0.035	9.50 (5.11)	10.96 (5.719
STAI-S PRE-STAI-S POST				
STAI-T PRE-STAI-R POST				
FFMQ-SF:Observe PRE-FFMQ-SF:Observe POST				
FFMQ-SF: Describe PRE-FFMQ-SF: Describe POST				
FFMQ-SF: act with awareness PRE-FFMQ-SF: act with awareness POST				
FFMQ-SF: Non-judging PRE-FFMQ-SF: Non-judging POST				
FFMQ-SF: Non-reacting PRE-FFMQ-SF: Non-reacting POST				
FFMQ-SFPRE-FFMQ-SF POST				
CD-RISCPRE-CD-RISC POST				
NPAQ: Academic performance PRE-NPAQ: Academic performance POST				
NPAQ: Interpersonal relationships PRE-NPAQ: Interpersonal relationships POST				
NPAQ: Emotional state PRE-NPAQ: Emotional state POST	-2.773	≤ 0.008	5.28 (3.92)	6.69 (4.52)
NPAQ PRE-NPAQ POST	-2.152	≤ 0.036	18.67 (9.89)	20.88 (11.06)
Would you request psychological care with regard to academic conditions, interpersonal relationships and emotional state? (yes)	**χ^2**	***p***	**Pretest n (%)**	**Postest n (%)**
Study Method PRE-Study Method POST				
Academic performance PRE-Academic performance POST	9.596	≤ 0.002	32 (60.4)	29 (54.7)
Work overload PRE-Work overload POST	5.307	≤ 0.021	26 (49.1)	37 (69.8)
Fear of speaking in public PRE- Fear of speaking in public POST	11.021	≤ 0.001	31 (58.5)	31 (58.5)
Peer relationships PRE-Peer relationships POST	11.708	≤ 0.001	28 (52.8)	28 (52.8)
Requesting help PRE-Requesting help POST				
Expressing opinions/emotions PRE-Expressing opinions/emotions POST	4.956	≤ 0.026	30 (56.6)	23 (43.4)
Family relationships PRE-Family relationships POST	3.984	≤ 0.046	23 (43.4)	24 (45.3)

Stress/Physical discomfort PRE-Stress/ Physical discomfort POST	13.340	≤ 0.000	20 (37.7)	28 (52.8)
Distancing oneself from personal problems PRE-Distancing oneself from personal problems POST	6.858	≤ 0.009	32 (60.4)	34 (64.2)
Inability to face the future PRE-Inability to face the future POST	5.443	≤ 0.020	29 (54.7)	27 (50.9)
Abandonment of relevant activities PRE-Abandonment of relevant activities POST				
Would you request psychological care and help in healthy habits? (yes)				
Food PRE-Food POST	9.856	≤ 0.002	24 (45.3)	25 (47.2)
Sleep PRE-Slelp POST	14.018	≤ 0.000	25 (47.2)	28 (52.8)
Exercise PRE-Exercise POST	20.107	≤ 0.000	23 (43.4)	23 (43.4)
Free time PRE-Free time POST				
Sexual relationships PRE-Sexual relationships POST				
Alcohol PRE-Alcohol POST				
Smoking PRE-Smoking POST				
Addictive substances PRE-Addictive substances POST				
Social networks PRE-Social networks POST				
Gambling PRE-Gambling POST				
Would you go to the university's psychological assistance service?				
Yes				
No				
			Pretest	**Postest**
	t	***p***	**M (SD)**	**M (SD)**
Utility of psychological assistance PRE-Utility of help for psychological assistance POST	4.294	≤ 0.000	8.11 (1.84)	6.37 (2.80)
	χ^2	***p***	**PRETEST n (%)**	**POSTEST n (%)**
Emotions				
Emotions Unpleasant PRE-Emotions Unpleasant POST	6.872	≤ 0.009	26 (49.1)	35 (66)

Effectiveness of the interventions

Unfortunately, against our expectations, we found no statistically significant differences between the groups, i.e. we found no statistically significant differences between the interventions used (app "Calm", app "E-Trainer" and wait-list control) and the variables under study. Only one statistically significant difference was obtained, being with the variable of whether participants needed psychological assistance from theuniversity at post-test (χ^2 = 7.317; p ≤ 0.026), where students in the "E-Trainer" group presented a mean score of 23.52, those in the "Calm" group had a mean score of 28.74, and those in the wait-list group showed a mean score of 33.10. Therefore, we can say that it was the students in the control group who considered it most necessary to contact the university psychologist.

Table 4 shows the results for the use of the different apps and their utility.

Paired-sample pre-test-post-test repeated measures

Table 5 shows the statistically significant differences in the repeated measures after matching the 53 students that took part in both the pre-test and the post-test and who therefore remained in the study from the beginning to the end.

Discussion

The aim of the study was to test the effectiveness of two mobile app preventive programs ("Calm" and "E-Trainer") in promoting health, resilience, mindfulness, emotion management and coping skills in first-year Health Sciences undergraduates.

Firstly, the mean pre-test scores obtained by our students on the GHQ-28, PHQ-15 and NPAQ were low, which suggests an absence of somatic symptoms, psychiatric disorders and distress as regards academic performance, interpersonal relationships and emotional state. By NPAQ item, difficulties and distress were generated in the greatest percentage of students by the fear of speaking in public, study methods, work overload, emotional difficulties requesting help, distancing oneself from personal problems and expressing opinions/ emotions. Similar results were found by Fernández-Rodríguez, et al. [31] and Martínez-Lorca, et al. [32]

in Spanish university students. Regarding interest in receiving psychological care (yes/no) in relation to 10 healthy habits, we can see that sleep, physical exercise and food are important, which is consistent with the results of Fernández-Rodríguez, et al. [31] and Martínez-Lorca, et al. [32] . During students' time at university, it is common to find changes in habits regarding self-care, food, sexual relationships and risk behaviours, which may be at the root of future health problems and have a negative influence on academic performance [33]. Hence, it is important and necessary to analyse the needs and specific demands for psychological assistance of university students. Finally, a large number of students (82.5%) would seek psychological assistance at the university, finding it highly useful. This data was similar in Martínez-Lorca, et al. [32]. In this context, promoting healthy habits and offering counselling and psychological treatment for university students is paramount in prevention, identification, improving and treating the quality of their educational competences and the quality of their daily lives.

As regards anxiety, many works have reported high levels of anxiety among university students [2-5], although our participants' scores were intermediate on both the STAI-S and STAI-T.

The students' resilience capacity measured on the CD-RISC shows scores that are slightly above medium, which suggests their capacity for positive adaptation patterns when faced by situations of risk is adequate and normal, exhibiting moderate social and personal competences. Resilience has been positively correlated with well-being, quality of life and mental health [6,34].

The results of the FFMQ-SF and its subscales show a high mean score, which suggests the students make use of mindfulness in an appropriate, optimal way. Other studies on university students have also reported high scores in this [2,35].

Related to current emotions, curiosity is the highest-ranked emotion. Curiosity is an emotion that promotes learning and is at the root of the teaching-learning process [29,30], and students that have recently started university evidently feel interest and curiosity in exploring and becoming familiar with their new environment [4]. Joy is the second most common emotion (23.4%), which is striking, although Martínez Arriaga, et al. [36] found similar percentages to those in our study. Nonetheless, we also found a presence of sadness and fear in response to the changes in this new academic life [7].

However, in the mean post-test scores, it is interesting to observe that the students who continued with the study show higher scores in almost all the variables analysed. This result is intriguing as we might think that the students that continued in the study were those with real health problems and/or who were very concerned about their state of health, academic performance, while those that dropped out had no such concerns or underestimated them. Yet, it seems they might be the ones who most need assistance. Along these lines, the law of inverse care, a term coined more than 50 years ago [37,38] by Tudor, highlights that the availability of adequate health care tends to vary inversely according to the needs of the population, i.e. those who most need health services are those who use them the least, and vice versa, those who need the least care are those who demand the most. From this perspective, we believe that universities should make progress in implementing health promotion actions that are able to prioritise those who need them most.

Further to these results, lower post-test mean scores were obtained on the FFMQ-SF and on almost all of its factors. The FFMQ is sensitive to the changes experienced by individuals that perform mindfulness-based interventions, but this does not seem to be the case in our study. Other studies showed changes [10].

Secondly**,** the amount of experimental mortality that occurred in this study triggered our interest in ascertaining what happened to university students who dropped out of the study and did not participated in the post-test, compared to their peers who continued. This comparison showed that the continuers in the study had the higher scores on the PHQ-15, so would thus be more concerned about their health and symptomatology. Similarly, the continuing students would seek psychological help to improve their study method and academic performance.

Therefore, despite the large number of university students that dropped out of the study and were, therefore, lost at post-test, our results are interesting because they suggest our study is of great use in recognizing students that are more interested in their health and academic issues and therefore wish to continue in the research, maybe with an important intrinsic motivation usually which drives greater self-discipline, increasing user retention [35].

Indeed, academic and health-related issues are important areas for intervention among university students in general [6,28,33]. Hence, it is important and necessary to analyse undergraduates' specific needs and demands for psychological assistance at the start of the academic year in order to be able to offer them counselling and psychological treatment and thus improve the quality of their educational competences and that of their daily lives.

Thus, universities should create mechanisms to detect such students, implementing awareness campaigns and actions to detect problems and promote mental health [32]. In fact, the university has been operating an SOAAP (Psychological and Psychopedagogical Care Service) since 2006. This multi-campus service is a

free, confidential psychological and psychopedagogical counselling service for all members of the university. The aim is to help individuals across, a limited number of sessions, the entire educational community to deal with problems of adaptation, and emotional, behavioural, learning difficulties, etc., in order to guide, direct, or arbitrate possible solutions [39]. It is worth noting that the SOAPP witnessed an increase in demand in 2020 with respect to the year before, according to the data contained in the Social Responsibility Report 2018-2020, published by the Social Council of the UCLM. Therefore, as suggested by Fernández-Rodríguez, et al. [31] and Pinto and Martins [40], students who benefit from counselling services at their universities are better prepared to face the personal, emotional, social and academic contingencies involved in the university environment.

Thirdly**,** the main aim of this study has revealed, contrary to our expectations, the lack of effectiveness of the interventions used (the "Calm" and E-Trainer" apps), both when comparing the two interventions groups with each other and when comparing the two intervention groups with the control group. Other studies that have also used the "Calm" app found no significant change in the stress or health variables studied [41,42]. Other interventions using mobile device technology have reported modest results with no clear evidence of benefit [43]. Therefore, it would be interesting to continue analysing the effectiveness of these, or other, applications related to mindfulness, emotional management and health, given the massive use of mobile phones in today's society [6,34,44] and due to the existing proliferation of apps for mental health [10,34,41,44]. Future research is needed to determine and compare the efficacy of mindfulness apps in randomized controlled trials**.**

Nonetheless, a statistically significant difference was obtained with the variable of whether the undergraduates needed psychological assistance from the university at post-test. The students in the control group were those who considered it most necessary to attend the psychological support service provided by the university, followed by the group that used the "Calm" app and, finally, the students in the "E-Trainer" group being those reporting less need for assistance. As mentioned, the Psychological and Pshychopedagogical Support Service (SOAPP) of the university aims to help members of the entire educational community to address problems of adaptation, and emotional, behavioural, learning difficulties, etc., with users of this service showing significant benefits [31,32,34,40]. Therefore, our results lead us to conclude that the students that received no intervention, that is, those in the control group, would be the ones more likely to attend the SOAPP if necessary.

The fact that we found only one statistically significant difference when comparing the intervention groups with the control group, across all the variables in the study, raises several questions, especially when other studies using the "Calm" app have found significant benefits for anxiety, stress, health, wellness and perceived stress among first-year university students [11]. Additionally, other apps similar to those proposed by our work have also found a positive effect among university students [34,44,45].

Consequently, it is worth asking what make have happened in our study to render our interventions so ineffective. Possibly, we did not monitor the time spent accessing the applications, a factor that hinders adherence to the interventions [9,46]. In this line, the frequency of use is very low, with a large percentage of students never using it, or if they did so, it was only when they felt unwell or remembered it. Furthermore, 64.2% of students did not find it useful, which is in stark contrast to the data reported by Huberty, et al. [11] and Laird, et al. [42], where users expressed satisfaction with the app and felt it was appropriate and useful. In this respect, certain studies have proposed incorporating improvements to ensure adherence to and satisfaction with the application, such as including timers, providing reminders/push notifications, advice on the usefulness of engaging in mindfulness, using video infographics to explain the concepts, relevant take-home activities, tracking progress, gamification, the possibility of contactinga mental health professional,etc. [7,11,34,41,44].

Fourthly**,** the results of the paired-sample repeated measure test performed in this study at both times (pre-test and post-test) show that at post-test, these students showed higher scores in many of the variables analysed. Above all, in the variables related to health as measured through the GHQ-28 and the PHQ-15, as well as in NPAQ and in the emotional state subscale.

Furthermore, the students paired at post-test showed higher scores in the following situations that could be mitigated by seeking help from the university's psychological support service: work overload, difficulties in family relationships, stress/physical discomfort, distancing oneself from personal problems, and healthy eating and sleeping. They also presented poorer scores on academic performance, expressing opinions/emotions and expressing inability to face the future. Additionally, these students were those that had a poorer opinion of the usefulness of seeking psychological assistance and also presented more unpleasant emotions.

These results show that the undergraduates paired at the two test times, and who had completed the full study, 7 months later continued to have more emotional distress, somatic symptoms, anxiety/insomnia, social dysfunction, and requested psychological care with regard to academic conditions, interpersonal relationships and their emotional state. Therefore, the university urgently needs to implement measures

to improve academic aspects and interpersonal relationships, to promote health, emotional well-being and mental health in those students most susceptible to suffering bio-psycho-social distress, through, for example, as mentioned, the SOAPP, given that, in our study, the proposed and analysed interventions were ineffective in improving the mental health status in first-year students on Health Sciences degree courses.

Thus, we can conclude that the proposal presented in the present study failed to achieve, through both of the interventions, the aim of enhancing health, resilience, and mindfulness, manage emotions and coping skills in first-year undergraduates enrolled in Health Science Degree courses. The only variable to show statistical significance was that of whether they needed psychological assistance from the university at post-test, with this significance being highest in the control group, followed by the "Calm" group and, finally, the "E-Trainer" group.

Nonetheless, our study was able to retain a large number of university students until it ended at post-test and to ascertain what happened to them. Thus, we found they had the most difficulties in mental health, academic conditions, interpersonal relationships, emotional state, healthy habits and emotions. Hence, it is necessary for the university to bolster, improve, and promote the SOAPP and highlight its services of to all students, in general, and, in particular, to those that are more vulnerable and need to use such services to deal with the personal, emotional, social and academic contingencies involved in the university environment and, especially, at the beginning of their university experience.

Finally, as regards the limitations of the study, the most important one is that related to missing data, as this is a longitudinal study. The study began with a large number of students, but a significant percentage dropped out, making it difficult to obtain statistically significant differences in the variables under study. It would have been interesting to know the reasons why these students dropped out. Therefore, future research is needed with a larger number of participants or it is necessary to safeguard adherence to the study. Regardless of this level of dropout, it seems our work shows that the university students who continued in the research were those needing more support and resources, and thus our research was able to successfully filter these students and maintain them throughout the study**.**

Another limitation of the study arguably lies in the mobile applications used being very different in their initial objectives, as one was based on emotion management ("E-Trainer") and the other on mindfulness ("Calm"). As in other works [15,34,41] the aims and evidence base vary greatly between the apps, which makes it difficult to integrate the results.

Declaration of Interests

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Authors Contributions

The paper is the result of my work and that of my team. M. Martínez-Lorca and A. Martínez-Lorca developed the study concept and designed the study. M. Martínez-Lorca collected the data. M. Martínez-Lorca and A. Martínez-Lorca analyzed the data, with assistance from J.J. Criado Álvarez. M. Martínez-Lorca and J.J. CriadoÁlvarez drafted the manuscript. All authors provided critical revisions. All authors approved the final manuscript for submission.

It contains no published or written content by others, except as expressly indicated and quoted in the paper.

All procedures performed in this study involving human participants were in accordance with the ethical standards of the University's Research Ethics Board and with the 1975 Helsinki Declaration. Informed consent was obtained from all participants.

Informed Consent Statement

Informed consent was obtained from all individual participants included in the study.

Data Availability Statement

The data that support the findings of this study are available from the corresponding author upon reasonable request.

Declaration of Competing Interest

The authors declare no conflict of interest.

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References

1. Cañero PM, Mónaco GE, Montoya CI (2019) Emotional intelligence and empathy as predictors of subjective well-being in university students. Eur J Investig Health Psychol Educ 9: 19-29.

2. Laure T, Engels RCME, Remmerswaal D, Spruijt-Metz D, Konigorski S, et al. (2023) Optimization of a transdiagnostic mobile emotion regulation intervention for university students: Protocol for a microrandomized trial. JMIR Res Protoc 12: e46603.

3. Martinez Lorca M, Zabala-Baños MC, Morales Calvo S, Romo RA, Martínez-Lorca A (2023) Assessing emotional, empathic and coping skills in Spanish undergraduates in health sciences and social sciences. Retos 47: 126-137.

4. Martinez-Lorca M, Zabala Baños MC, Morales Calvo S, Aguado Romo R, Martínez-Lorca A (2023) Mental Health, affect and emotions in Spanish university students of health and social sciences. Retos 49: 163-173.

5. Sanchis-Soler G, García-Jaén M, Sebastia-Amat S, Diana-Sotos C, Tortosa-Martinez J (2022) Actions for a healthy university: Impact on mental and physical health in young people. Retos 44: 1045-1052.

6. Harrer M, Adam SH, Fleischmann RJ, Baumeister H, Auerbach R, et al. (2018) Effectiveness of an internet- and app-based intervention for college students with elevated stress: Randomized controlled trial. J Med Internet Res 20: e136.

7. Six SG, Byrne KA, Aly H, Harris MW (2022) The effect of mental health app customization on depressive symptoms in college students: Randomized controlled trial. JMIR Ment Health 9: e39516.

8. Palma-Gómez A, Herrero R, Baños R, García-Palacios A, Castañeiras C, et al. (2020) Efficacy of a self-applied online program to promote resilience and coping skills in university students in four Spanish-speaking countries: Study protocol for a randomized controlled trial. BMC Psychiatry 20: 148.

9. González-García M, Álvarez JC, Pérez EZ, Fernandez-Carriba S, López JG (2021) Feasibility of a brief online mindfulness and compassion-based intervention to promote mental health among university students during the COVID-19 pandemic. Mindfulness 12: 1685-1695.

10. Horrillo-Álvarez B, Marín-Martín C, Abuín MR (2019) La adherencia al entrenamiento en meditación mindfulness con registro en papel y en aplicación móvil. Clínica y Salud 30: 99-108.

11. Huberty J, Green J, Glissmann C, Larkey L, Puzia M, et al. (2019) Efficacy of the mindfulness meditation mobile app "Calm" to reduce stress among college students: Randomized controlled trial. JMIR MHealth UHealth 7: e14273.

12. Regehr C, Glancy D, Pitts A (2013) Interventions to reduce stress in university students: A review and meta-analysis. J Affect Disord 148: 1-11.

13. Wielgosz J, Goldberg SB, Kral TRA, Dunne JD, Davidson RJ (2019) Mindfulness meditation and psychopathology. Annu Rev Clin Psychol 15: 285-316.

14. Daya Z, Hearn JH (2018) Mindfulness interventions in medical education: A systematic review of their impact on medical student stress, depression, fatigue and burnout. Med Teach 40: 146-153.

15. Rodríguez-Riesco L, Senín-Calderón C (2022) Aplicaciones móviles para evaluación e intervención en trastornos emocionales: una revisión sistemática. Ter Psicol 40: 131-151.

16. Lecomte T, Potvin S, Corbière M, Guay S, Samson C, et al. (2020) Mobile apps for mental health issues: Meta-review of meta-analyses. JMIR MHealth UHealth 8: e17458.

17. Onyeaka H, Firth J, Kessler RC, Lovell K, Torous J (2021) Use of smartphones, mobile apps and wearables for health promotion by people with anxiety or depression: An analysis of a nationally representative survey data. Psychiatry Res 304: 114120.

18. Goldberg D (1978) Manual of the General Health Questionnaire. NFER-Nelson, Windsor.

19. Lobo A, Muñoz PE (1996) Cuestionario de salud general. GHQ (General Health Questionnaire). Guía para el usuario de las distintas versiones. Versiones en lengua española validadas. Barcelona, Spain, Masson.

20. Kroenke K, Spitzer RL, Williams JBW (2002) The PHQ-15: Validity of a new measure for evaluating the severity of somatic symptoms. Psychosom Med 64: 258-266.

21. Ros Montalbán S, Comas Vives A, Garcia-Garcia M (2010) Validación de la versión española del cuestionario PHQ-15 para la evaluación de síntomas físicos en pacientes con trastornos de depresión y/o ansiedad: estudio depresoma. Actas Españolas de Psiquiatría 38: 345-357.

22. Van Knippenberg FCE, Duivenvoorden HJ, Bonke B, Passchiner J (1990) Shortening the state-trait anxiety inventory. J Clin Epidemiol 43: 995-1000.

23. Buela-Casal G, Guillén-Riquelme A (2017) Short form of the Spanish adaptation of the State-Trait Anxiety Inventory. Int J Clin Health Psychol 17: 261-268.

24. Bohlmeijer E, ten Klooster PM, Fledderus M, Veehof M, Baer R (2011) Psychometric properties of the Five-Facet Mindfulness Questionnaire in depressed adults and development of a short form. Assessment 18: 308-320.

25. Cebolla A, García-Palacios A, Soler J, Guillen V, Baños R, et al. (2012) Psychometric properties of the Spanish validation of the Five Facets of Mindfulness Questionnaire (FFMQ). Eur J Psychiat 26: 118-126.

26. Connor KM, Davidson JRT (2003) Development of a new resilience scale: The Connor-Davidson resilience scale (CD-RISC). Depress Anxiety 18: 76-82.

27. Notario-Pacheco B, Solera-Martinez M, Serrano-Parra MD, Bartolomé-Gutierrez R, García-Campayo J, et al. (2011) Reliability and validity of the Spanish version of the 10 item Connor -Davidson Resilience Scale (10 item CDRISC) in young adults. Health and Quality of Life Outcomes 9: 63.

28. Fernández C, García T, Paz MD (2015) Cuestionario de Valoración de Necesidades de Atención Psicológica [Evaluation of Needs for Psychological Assistance Questionnaire]. Manuscrito no publicado. Unidad de Psicología Clínica y de la Salud. Universidad de Oviedo, Oviedo.

29. Aguado RR (2014) Es emocionante saber emocionarse. Madrid: EOS.

30. Aguado RR (2015) La emoción decide y la razón justifica. Madrid: EOS.

31. Fernández-Rodríguez C, Soto-López T, Cuesta M (2019) Needs and demands for psychological care in university students. Psicothema 31: 414-421.

32. Martínez-Lorca M, Martínez-Lorca A, Álvarez-Criado JJ (2021) Necesidades psicológicas de los estudiantes universitarios en tiempos de COVID-19. En: Alonso S, Trujillo JJ, Moreno AJ Rodríguez C, Investigación Educativa en Tiempos de Pandemia. Editorial Dykinson, ISBN: 978-84-11220200.

33. Lee RA, Jung ME (2018) Evaluation of an mHealth App (DeStressify) on university students' mental health: Pilot trial. JMIR Ment Health 5: e2.

34. Harith S, Backhaus I, Mohbin N, Ngo HT, Khoo S (2022) Effectiveness of digital mental health interventions for university students: An umbrella review. Peer J 10: e13111.

35. Shabir H, D'Costa M, Mohiaddin Z, Moti Z, Rashid H, et al. (2022) The barriers and facilitators to the use of lifestyle apps: A systematic review of qualitative studies. Eur J Investig Health Psychol Educ 12: 144-165.

36. Martínez Arriaga RJ, González Ramírez LP, de la Roca-Chiapas JM, Hernández-González M (2021) Psychological distress of COVID-19 pandemic and associated psychosocial factors among Mexican students: An exploratory study. Psychol Sch 58: 1844-1857.

37. Crochemore-Silva I, Knuth AG, Mielke GI, Loch MR (2020) Promoção de atividade física e as políticas públicas no combate às desigualdades: reflexões a partir da Lei dos Cuidados Inversos e Hipótese da Equidade Inversa. Cad Saúde Pública 36.

38. Martín Zurro A, Segura Benedicto A (2021) La atención primaria española en el 50 aniversario de la ley de cuidados inversos. Atención Primaria 53: 102055.

39. Galván-Bovaira MJ, Carpio MC (2013) Los servicios de atención psicológica y psicopedagógica contribuyendo a la mejora de la calidad de la educación superior. El servicio de atención psicológica de la universidad de castilla la mancha. FECIES 2013, 520-525.

40. Pinto J, Martins M (2017) Necesidades de intervención psicológica: validación de una encuesta con estudiantes universitarios portugueses || Psychological intervention needs: validation of a survey with Portuguese University students. Revista de Estudios e Investigación en Psicología y Educación 4: 112-121.

41. Mani M, Kavanagh DJ, Hides L, Stoyanov SR (2015) Review and evaluation of mindfulness-based iphone apps. JMIR Mhealth Uhealth 3: e82.

42. Laird B, Puzia M, Larkey L, Ehlers D, Huberty J (2022) A mobile app for stress management in middle-aged men and women (Calm): Feasibility randomized controlled trial. JMIR Form Res 6: e30294.

43. Free C, Phillips G, Watson L, Galli L, Felix L, et al. (2013) The effectiveness of mobile-health technologies to improve health care service delivery processes: A systematic review and meta-analysis. PLoS Med 10: e1001363.

44. Lira D, Caviedes P, Martínez V (2023) Adaptation of a mobile app for early anxiety and depression intervention in university students in Chile: participatory study. BJPsych Int 20: 37-41.

45. Trottier CF, Lieffers JRL, Johnson ST, Mota JF, Gill RK, et al. (2021) The impact of a web-based mindfulness, nutrition, and physical activity platform on the health status of first-year university students: Protocol for a randomized controlled trial. JMIR Res Protoc 10: e24534.

46. Rith-Najarian LR, Boustani MM, Chorpita BF (2019) A systematic review of prevention programs targeting depression, anxiety, and stress in university students. J Affect Disord 257: 568-584.