PHYSICAL FITNESS AND MENTAL HEALTH: ANALYSIS OF STRESS, ANXIETY AND DEPRESSION IN CHILEAN UNIVERSITY STUDENTS

CONDICIÓN FÍSICA Y SALUD MENTAL: ANÁLISIS DE ESTRÉS, ANSIEDAD Y DEPRESIÓN EN UNIVERSITARIOS CHILENOS

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Abstract

Following the COVID-19 pandemic, levels of stress, anxiety and depression have increased among university students, exacerbated by academic demands, strict schedules and risky behaviors. The present study analyzed the relationship between levels of stress, anxiety, depression and perceptions of physical fitness in Chilean university students. A cross-sectional design was used with a sample of 584 students from different university careers, average age 20.98 (*SD* = 2.68). Psychological variables were assessed using the Anxiety, Depression and Stress Scale (DASS-21), while perceptions of physical fitness were measured using the International Fitness Scale (IFIS). The results showed a significant correlation between perceived physical fitness and levels of stress, anxiety and depression. Additionally, women reported higher levels of anxiety and stress, but not depression. However, linear regression models were run which showed that 4% of the variance in depression could be explained by general physical condition and muscle strength. In case of anxiety, 11% of the variance is explained by general physical fitness and cardiovascular fitness. Finally, 5% of the variance in stress is explained by gender. Therefore, it can conclude that psychological factors have a relevant impact on perceptions of physical fitness, highlighting the importance of comprehensive strategies that address both mental and physical health in this group.

Keywords: Anxiety, depression, mental health, physical fitness, stress, students.

Resumen

A raíz de la pandemia de COVID-19, los niveles de estrés, ansiedad y depresión en universitarios han aumentado, agravados por las exigencias académicas, los horarios estrictos y las conductas de riesgo. Se analizó la relación entre los niveles de estrés, ansiedad, depresión y la percepción de la condición física en estudiantes universitarios chilenos. Se utilizó un diseño transversal con una muestra de 584 estudiantes de diferentes facultades, con una edad promedio de 20.98 años (*DE* = 2.68). Las variables psicológicas se evaluaron con la Escala de Ansiedad, Depresión y Estrés (DASS-21), mientras que la condición física percibida se utilizó la International Fitness Scale (IFIS). Los resultados indicaron una correlación entre los niveles de percepción de condición física percibida y los niveles de estrés, ansiedad y depresión. Además, las mujeres reportaron un nivel más alto de ansiedad y estrés, pero no así en los niveles de depresión. Por otra parte, los modelos de regresión lineal mostraron que el 4% de la varianza en depresión puede ser explicado por la condición física general y la fuerza muscular. Para el caso de la ansiedad, el 11% se explica por la condición física general y cardiovascular. Luego, el 5% del estrés es explicado por el sexo. Finalmente, se puede concluir que la percepción de la condición física tienen un impacto relevante en los factores psicológicos, destacando la importancia de estrategias integrales que aborden tanto la salud mental como física.

Palabras clave: Ansiedad, condición física, depresión, estrés, estudiantes, salud mental.

Introduction

In recent years, and with particular emphasis on the period of 2020–2022 following the global pandemic of 2020, there has been an increase in the prevalence of stress, anxiety and depression among university students on a global scale (Silva-Ramos et al., 2020; Wunsch et al., 2021; Merellano-Navarro et al., 2022). This demographic is susceptible to specific conditions that render them more vulnerable to psychological distress and the manifestation of various symptoms associated with poor mental health (Akram et al., 2020). Increased academic demands, adherence to schedules, and risky behaviours such as caffeine, tobacco, and alcohol consumption (de la Portilla et al., 2018) and poor sleep quality (Merellano-Navarro et al., 2022) contribute to the deterioration of both physical and mental health (Barrera-Herrera & San Martín, 2021). In this context, a large-scale survey of 14,000 students from 19 universities in eight different countries revealed that only 35% of students met the diagnostic criteria for at least one mental health disorder (Auerbach et al., 2016). Moreover, a systematic review conducted in 2021 on risk factors and the prevalence of mental health problems demonstrated a prevalence of depression of 25% in eight studies with a total of 13,790 participants, and a prevalence of suicide-related symptoms of 14% in four studies with 2,586 participants (Sheldon et al., 2021). Concurrently, an increase in mental health-related symptoms has been observed within the university population (Thorley, 2017), with stress, anxiety, depression, suicidal ideation, and insomnia being the most frequently reported symptoms (Akram et al., 2020). In the Chilean context, Barrera-Herrera & San Martín (2021) identified that over 45% of participants exhibited symptoms related to depression, anxiety or stress, and 5% reported suicidal ideation. In continuation with the national reality, data from 2022 demonstrate a deterioration in mental well-being, with a 21.1% increase in the prevalence of mental health problems, and particularly a 27.5% increase in generalised anxiety disorders (B).

Consequently, there is a significant need to seek strategies that mitigate the symptoms associated with mental health problems. In relation to this, various studies on university students have revealed that high stress levels are associated with a lower quality of life and overall well-being (Faria et al., 2014; Ribeiro & Stickgold, 2014). However, regular physical activity has been demonstrated to exert a beneficial effect on stress levels, functioning as a stress modulator (Gerber & Pühse 2009; Schultchen et al., 2019). In addition, it has been observed that levels of stress, anxiety and depression tend to increase in university students who accumulate more sedentary time (Lee & Kim, 2019). As posited by Nguyen-Michel et al. (2006), a significant negative relationship was identified between physical activity and stress levels. Conversely, an improvement in sleep quality can be achieved through the regulation of stress levels caused by physical activity (Zhai et al., 2021). This suggests that physical activity can be a viable non-pharmaceutical strategy for stress management, and consequently, an enhancement in sleep quality can be expected among university students. In consideration of the aforementioned factors, it is evident that a decline in physical activity is concomitant with a deterioration in physical fitness. It is important to note that health-related physical fitness is also influenced by many other factors, such as body weight and socioeconomic status (Kljajević et al., 2022). In this context, it is also interesting to learn about the effects of physical fitness. Suwannakul et al. (2023) demonstrated that elevated stress levels are associated with diminished components of physical fitness, including maximum oxygen consumption and upper limb muscle strength. In addition to this, as previously referenced, an affirmative correlation has been identified between aerobic capacity and psychological well-being, as well as in comprehensive assessments of health and quality of life among university students (Muñoz Strale et al., 2024). However, the concept of perceived physical condition, which encompasses the perception of physical fitness, has not been a subject of significant interest and may potentially play a crucial role in the modulation of stress, anxiety, and depression levels. Currently, objective tests exist which allow for the accurate assessment of the different components of physical condition. These include self-report tools such as the International Fitness Scale questionnaire (IFIS). The present questionnaire has been developed to measure a subject's perception of their overall physical condition, as well as that of each of its components (De Moraes et al., 2019). For instance, in pregnant women, a positive association was identified between perceived physical fitness and quality of life (general health dimension) (Romero-Gallardo et al., 2019). In this sense, perceived physical fitness can be considered a viable alternative, especially when physical fitness cannot be assessed directly in large sample sizes (Ortega et al., 2013). It has been demonstrated that the perceived physical condition can function as a predictor of metabolic health (Peña-Ibagon et al., 2021), and that it is associated with mental health symptoms (Cadenas-Sánchez et al., 2021). Therefore, the present study seeks to investigate whether perceived physical fitness influences levels of stress, anxiety, and depression in Chilean university students. As demonstrated above, it can be hypothesised that perceived physical fitness may serve as a significant

contributing factor in the levels of stress, anxiety and depression experienced by individuals. The present study aims to ascertain the correlation between perceived physical fitness and levels of stress, anxiety, and depression in Chilean university students.

Materials and Methods

Design

The research adopts a quantitative approach and follows a non-experimental design, characterised by its cross-sectional nature. The scope of the research is both descriptive and analytical (Veiga de Cabo et al., 2008).

Participants

The sample consisted of 584 participants, students from different programmes at a university in Santiago, Chile. In terms of gender, 90 participants identified as female (15%), while 494 identified as male (85%). This is because most of them are enrolled in programmes related to physical activity, areas in which female participation is generally lower. The age range of the participants was between 17 and 54 years, with an average age of 20.98 years (*SD* = 2.68). The median age was 21 years. Table 1 shows the characteristics of the sample. The inclusion criteria considered for this study were: being a regular undergraduate student, being between 17 and 55 years of age, and agreeing to participate voluntarily. On the other hand, participants who submitted incomplete responses in any of the questionnaires and/or did not attend the face-to-face assessment session were excluded.

Table 1

Characteristics of the Sample

	Sex	*N*	*M*	*SD*	*Min*	*Max*	Shapiro-Wilk W	Shapiro-Wilk *p-value*
Age	Female	90	21.3	2.34	18	28	.920	< .001**
	Male	494	20.9	2.74	17	54	.729	< .001**

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

Instruments

The Depression Anxiety Stress Scales-21 (DASS-21; Lovibond & Lovibond, 1995) is a self-report measure designed to assess symptoms of depression, anxiety, and stress in adults. The scale consists of 21 items distributed evenly across three subscales: depression, anxiety, and stress. Participants rate the frequency with which they have experienced each symptom in the past week on a scale from 0 (not applicable) to 3 (applies a lot or most of the time). To respond, the respondent must indicate the extent to which the statement describes what happened to them or how they felt during the past week (Antúnez & Vinet, 2012). The following scores are used for each subscale: Depression: normal 0-4, mild 5-6, moderate 7-10, severe 11-13, and extremely severe 14+. Anxiety: normal 0-3, mild 4-5, moderate 7-10, severe 11-13, and extremely severe 10+. Stress: normal 0-7, mild 8-9, moderate 10-12, severe 13-16, and extremely severe 17+ (Younes et al., 2016).

Confirmatory factor analysis supported the validity of the three-factor structure of the DASS-21. The results indicated that the factor loadings for the items on the stress subscale ranged from 0.51 to 0.71, with significant loadings ($p < .001$) for all items. For the anxiety subscale, factor loadings ranged from 0.35 to 0.67, also with statistical significance ($p < .001$). For the depression subscale, factor loadings were even stronger, ranging from 0.57 to 0.81, all with significance ($p < .001$). The model fit was evaluated using several goodness-of-fit tests. The chi-square value was significant (χ^2 [178] = 419.13, $p < .001$), which is to be expected given the sensitivity of this test to sample size. However, other fit measures indicated a good fit of the model, with a CFI of 0.95, a TLI of 0.94, and an RMSEA of 0.05 (*90% CI* = [0.04, 0.05]).

In terms of reliability, Cronbach's alpha coefficients for the subscales were adequate: 0.82 for the stress subscale, 0.77 for the anxiety subscale, and 0.87 for the depression subscale, indicating satisfactory internal consistency for each dimension.

The International Fitness Scale (IFIS; Ortega et al., 2011) is a self-reported tool designed to assess the subjective perception of physical fitness in adults. The scale consists of five items that measure aspects related to general physical fitness, muscle strength, aerobic capacity, flexibility, and speed/agility (Olivares et al., 2017). The items are scored on a Likert scale from 1 (very poor) to 5 (very good). This tool has already been applied to the Chilean population, both in adolescents (Olivares et al., 2017) and Chilean university students (Guzmán-Muñoz et al., 2024). In the present study, numerical values were assigned to each response in order to facilitate statistical processing and analysis of relationships between variables. This methodology has been used in previous research with the Chilean university population, such as that of Guzmán-Muñoz et al. (2024). This strategy allows for a more robust analysis using parametric and correlational tests, respecting the ordinal nature of the instrument but taking advantage of its analytical potential in descriptive and exploratory contexts.

Confirmatory factor analysis supported the validity of the scale's unifactorial structure. Factor loadings were high and statistically significant ($p < .001$) for all items, with values ranging from 0.39 to 0.85. The model fit was adequate, with a non-significant chi-square value ($\chi^2[4] = 8.76$, $p = .067$), suggesting a good fit of the model to the data. In addition, other fit measures showed excellent fit: the CFI was 0.99, the TLI was also 0.99, and the RMSEA was 0.05 (*90% CI* = [0.00, 0.09]). In terms of reliability, Cronbach's alpha coefficient was 0.76 for the entire scale, indicating acceptable internal consistency.

Procedure

Following the dissemination of a public invitation within the university campus, individuals were invited to participate in the study voluntarily. Following this, informed consent was requested. The administration of the questionnaires was conducted in a manner that ensured the confidentiality of responses. This was achieved by undertaking the administration of the questionnaires individually and privately within the Sports Science Laboratory. The approximate duration of the administration of the questionnaires was 15 minutes. Prior to the commencement of the session, all relevant details were thoroughly delineated, and a designated time period was allocated for the articulation of queries.

Statistical Analysis

Statistical analysis was performed using Jamovi (version 2.5). Data normality was assessed using Shapiro-Wilk. Correlations were analysed using Pearson, and multiple regression was used to identify predictors of physical condition perception. A significance level of $p < .05$ was considered, and results were presented with 95% confidence intervals.

Results

Table 2 shows the emotional symptoms perceived in the sample. Most women (61.11%) and men (63.77%) did not present depressive symptoms, although nearly 38% of women and 36% of men reported some level of depression, with moderate depression being the most prevalent. In terms of anxiety, 38.89% of women and 54.45% of men did not present symptoms, with moderate anxiety predominating in both sexes. With regard to stress, 56.67% of women and 72.47% of men did not report symptoms.

Table 2

Perceived Symptoms of the Sample

Symptoms	Sex	Classification	N
Depression	Female	No Depression	61.11%
		Extreme Depression	4.44%
		Severe Depression	8.89%
		Moderate Depression	17.78%
		Mild Depression	7.78%
	Male	No Depression	63.77%
		Extreme Depression	4.05%
		Severe Depression	5.47%
		Moderate Depression	15.38%
		Mild Depression	11.34%
Anxiety	Female	No Anxiety	38.89%
		Extreme Anxiety	17.78%
		Severe Anxiety	8.89%
		Moderate Anxiety	24.44%
		Mild Anxiety	10.00%
	Male	No Anxiety	54.45%
		Extreme Anxiety	7.29%
		Severe Anxiety	6.07%
		Moderate Anxiety	19.64%
		Mild Anxiety	12.55%
Stress	Female	No Stress	56.67%
		Extreme Stress	3.33%
		Severe stress	16.67%
		Moderate stress	13.33%
		Mild stress	10.00%
	Male	No Stress	72.47%
		Extreme Stress	2.43%
		Severe stress	6.68%
		Moderate stress	14.17%
		Mild stress	4.25%

Table 3 shows the descriptive results obtained regarding the perception of physical condition by gender. It shows that men have a higher perception of their overall physical condition (3.88 ± 0.853) than women (3.57 ± 0.900), and this is repeated in a similar way in the cardio-respiratory, strength, speed and agility components. However, in the case of flexibility, women show higher levels (3.56 ± 1.22) than men (3.10 ± 1.13).

Table 3

Descriptive Statistics for Perceived Physical Condition

	Sex	*M*	*SD*	*Min*	*Max*
General physical condition	Female	3.57	0.900	1	5
	Male	3.88	0.853	1	5
Cardio-respiratory	Female	3.11	1.18	1	5
	Male	3.64	1.01	1	5
Strength	Female	3.49	0.986	1	5
	Male	3.73	0.930	1	5
Speed - Agility	Female	3.33	0.899	1	5
	Male	3.79	0.935	1	5
Flexibility	Female	3.56	1.22	1	5
	Male	3.10	1.13	1	5

To complement these results, different ANCOVA tests were performed to examine differences between men and women in depression, anxiety, stress, and perceived physical condition, where age was considered a covariate (given the high dispersion observed). These comparisons were made considering the variables as continuous, in order to obtain a better impression of the possible differences in magnitude.

No significant differences were found in depression levels between men (adjusted *M* = 0.59, 95% *CI* [0.54, 0.65]) and women (adjusted *M* = 0.69, 95% *CI* [0.56, 0.82]), $F_{(1, 580)} = 1.820$, $p = 0.178$, $\eta_p^2 = 0{,}003$. Significant differences were observed in stress, with women (adjusted *M* = 1.21, 95% *CI* [1.09, 1.34]) reporting higher levels than men (adjusted *M* = 0.90, 95% *CI* [0.85, 0.96]), $F_{(1, 581)} = 19.394$, $p < 0.001$, $\eta_p^2 = 0{,}032$. In terms of perceived physical fitness, women (adjusted *M* = 3.41, 95% *CI* [3.26, 3.55]) reported significantly lower levels than men (adjusted *M* = 3.63, 95% *CI* [3.57, 3.69]), $F_{(1, 581)} = 7.827$, $p = 0.005$, $\eta_p^2 = 0{,}013$.

In the case of anxiety, a significant effect of gender was found, $F(1, 579) = 5.08$, $p = .025$, $\eta_p^2 = .009$, with higher levels of anxiety reported by women (adjusted *M* = 0.81, 95% *CI* [0.70, 0.92]) compared to men (adjusted *M* = 0.53, 95% *CI* [0.49, 0.58]). Age was also significantly associated with anxiety ($p = .002$). However, Levene's test indicated a violation of the assumption of homogeneity of variances ($p = .010$), and the interaction between sex and age approached significance ($p = .079$). Due to the violation of the assumption of homogeneity of slopes, a linear regression model was chosen that included the interaction between sex and age, allowing us to estimate how the effect of sex on the dependent variable varies as a function of age.

The model was significant, $F_{(3, 579)} = 9.90$, $p < .001$, explaining 4.9% of the variance in anxiety ($R^2 = 0.049$). It was found that men reported significantly lower levels of anxiety than women ($\beta = -1.20$, $p = .025$), and that age was negatively associated with anxiety in general ($\beta = -0.06$, $p = .010$). Furthermore, the interaction between gender and age approached statistical significance ($\beta = 0.044$, $p = .079$), suggesting that the effect of age on anxiety may vary depending on gender. These results indicate that both gender and age influence anxiety levels, and that their interaction warrants further exploration.

In addition to the above, Table 4 presents Pearson's correlations between depression, anxiety, stress, overall perceived physical condition (the mean of all components of the International Fitness Scale), and age. The means and standard deviations for the total sample can also be found there.

Significant positive correlations were found between depression, anxiety, and stress, indicating that as one of these factors increases, so do the others. On the other hand, perceived physical condition showed significant negative correlations with depression, anxiety, and stress, suggesting that as perceived physical condition increases, the levels of these emotional factors decrease. Age had a significant negative correlation with anxiety, but no significant correlations were observed with the other variables.

Table 4

Means, Standard Deviations, and Pearson Correlations Between Depression, Anxiety, Stress, Perceived Physical Condition, and Age

	M	*SD*	Depression	Anxiety	Stress	Perceived Physical Condition
Depression	0.61	0.62				
Anxiety	0.57	0.53	0.65***			
Stress	0.95	0.63	0.68***	0.69***		
Perceived Physical Condition	3.6	0.71	-0.20***	-0.28***	-0.16***	
Age	20.98	2.68	-0.05	-0.10*	-0.02	0.08

Note. *$p < .05$. ** $p < .01$. *** $p < .001$.

Finally, different multiple linear regression models were compared to predict depression, anxiety, and stress based on perceived physical fitness levels, i.e., the five IFIS items, in addition to gender.

The regression model for predicting depression was statistically significant, $F(7.575) = 4.76$, $p < .001$, explaining 4% of the variance in depression (adjusted R2 = .04). The results show that the predictor of overall physical condition was significant ($B = -0.10$, $p = .041$), as was muscle strength ($B = -0.06$, $p = .046$). The other predictors, cardiovascular condition, speed-

agility, flexibility, and gender did not reach statistical significance ($p > .05$). This suggests that, in terms of depression, only perceptions of general fitness and muscle strength were significant predictors.

The model for anxiety showed a moderate fit and was significant, F(6.576) = 12.46, $p < .001$, explaining 11% of the variance in anxiety (adjusted R2 = .11). The predictors of general physical condition (B = −0.10, $p = .011$), cardiovascular condition (B = −0.06, $p = .021$), and gender (B = −0.19, $p = .001$) were significant. These results indicate that both perceived physical fitness and gender contribute significantly to anxiety levels, highlighting the differential influence of gender.

Regarding stress, the model was statistically significant, F (6.577) = 5.76, $p < .001$, but with a modest fit, explaining only 5% of the variance (corrected R2 = .05). The only significant predictor was Gender (B = −0.25, $p < .001$). This suggests that, unlike anxiety, IFIS components are not significantly associated with stress, and that gender is the only relevant factor in this model. The variable gender (men compared to women) showed a marginally significant difference (B = 0.15, $SE = 0.08$, $p = 1.91$, $p = .057$), suggesting that men tend to report higher perceived physical fitness. Age was not a significant predictor (B = 0.01, $SE = 0.01$, $p = 1.22$, $p = .223$).

In summary, the models for anxiety and stress show significant associations with gender, which is stronger in the stress model. In the case of anxiety, in addition to gender, perceptions of overall physical and cardiovascular fitness show significant relationships, which is not observed in stress or depression. This could indicate that the perception of physical fitness has a differential impact depending on the type of emotional distress, and that gender has a cross-cutting influence, especially on stress.

Discussion

The results obtained provide relevant evidence on the relationship between perceived physical condition and levels of depression, anxiety, and stress in Chilean university students. In line with previous studies (Hong et al., 2024), it has been observed that better overall physical condition is related to mental health and sleep quality (Merellano-Navarro et al., 2022). Furthermore, Gerber and Pühse (2009) also identified that perceived physical fitness is inversely related to levels of stress, anxiety and depression. In addition, inverse relationships were shown between cardiovascular capacity and the mental health and well-being of university students (Herbert et al., 2020). In this regard, previous studies have shown that the perception of overall physical condition and perceived cardiovascular capacity were significantly and positively associated with adolescents' perception of their health, life satisfaction, and quality of life (Marques et al., 2017). This reinforces the idea that the perception of one's own physical condition can act as an important modulator of mental health in university students. Therefore, prevention strategies can benefit from promoting physical activity and improving physical fitness, especially when stress or its effects are high, allowing the 'cycle' of inactivity, stress, and negative effects to be broken (Schultchen et al., 2019).

Regarding gender differences, the findings confirmed that women report significantly higher levels of anxiety ($M = 0.79$ in women and $M = 0.53$ in men) and stress ($M = 1.21$ in women and $M = 0.90$ in men) compared to men. This is consistent with previous research. For example, a study conducted by Santomauro et al. (2021) observed that, globally, the prevalence of depressive disorders among women was higher (29.8%) than among men (24.0%). Similarly, women experienced a greater increase in the prevalence of anxiety disorders (27.9%) than men (21.7%). Similarly, a study conducted in 2022 with 1,842 students showed that women report poorer mental health than men (Spagert et al., 2022). Therefore, higher levels of stress and anxiety have been documented in female university students due to social and/or cultural factors such as the fact that women tend to recognise and communicate their emotional states, whether negative or positive, to a greater extent (Barrera-Herrera & San Martín, 2021). In this sense, these differences could be explained by the different ways in which men and women express their emotions, mainly influenced by gender roles and social norms (Caqueo-Urízar et al., 2020). However, no significant differences were found in depression levels between men and women, which differs from some previous studies (Thorley, 2017; Akram et al., 2020; Bravo et., 2022), where women tend to show a higher prevalence of depressive symptoms. This could be due to particularities of the sample or contextual factors associated with the group of students evaluated.

On the other hand, men reported a better perception of their physical condition compared to women, except in the dimension of flexibility. These results are consistent with previous studies, where men have reported better overall physical condition, cardiorespiratory capacity, and agility (Mayorga-Vega et al., 2019; Peña-Ibagon et al., 2021). This could be related to

cultural and social factors that influence self-perception of physical fitness, as well as differences in physical activity patterns between men and women (Nguyen-Michel et al., 2006; Suwannakul et al., 2023).

The results highlight that the perception of physical condition has a differential impact on the emotional distress of university students. In the case of depression, only the perception of overall physical condition and muscle strength were significant predictors, although the model explained a low proportion of the variance (4%). For anxiety, the model was more robust (11% of variance explained), with significant predictors such as overall physical condition, cardiovascular condition, and gender, with women being more vulnerable. In contrast, the model for stress showed a modest fit (5%) and only gender was a relevant predictor, highlighting gender-related differences. Previous findings also revealed that university students with higher levels of physical fitness had a significant association with a lower risk of developing mental disorders (Åvitsland et al., 2020). Furthermore, among participants with different levels of physical fitness, a significant inverse relationship was identified between higher levels of physical fitness and the onset of low-risk mental disorders (Hong et al., 2024). Along the same lines, a meta-analysis conducted in 2020 examined the relationship between cardiovascular fitness and the incidence of psychological disorders, revealing that people with low levels of cardiovascular fitness had a 23.47% higher risk of developing mental disorders (Janssen et al., 2020). These findings suggest that perceived physical condition is more relevant to anxiety and depression than to stress, which may be more influenced by external factors. In addition, the cross-sectional influence of gender highlights the need for gender-sensitive approaches to improve emotional well-being in this population group.

This reveals that perceived physical condition could be used as a simple and effective tool to identify students at risk of high levels of stress, anxiety, and depression, especially in contexts where direct physical assessments are not possible (Ortega et al., 2013).

Limitations and Future Research

This study has some limitations that should be considered when interpreting the results. First, the sample was composed mainly of males, which could limit the generalisation of the findings to populations with greater gender equity. Second, the cross-sectional design of the study prevents the determination of long-term effects or the direction of the observed associations. Finally, it should be mentioned that no distinctions were made according to the programme the students are enrolled in, which could also affect the findings.

Future research could address these limitations by using longitudinal designs that allow for exploration of the directionality of the observed relationships, as well as by including more balanced samples in terms of gender and cultural diversity. It is also suggested that objective tools, such as body composition measurements and physical tests, be incorporated to complement subjective perception data and increase the validity of the findings.

Conclusions

In summary, the results of this study highlight the importance of perceived physical fitness as a factor associated with levels of depression, anxiety, and stress in Chilean university students. The perception of good physical fitness could play a protective role against emotional symptoms, while a poor perception could increase vulnerability to these problems. These findings underscore the need to promote strategies that encourage both physical activity and improved physical fitness in the university context, thereby contributing to the overall well-being of this population.

Ethics Committee Statement

The study was conducted in accordance with the Declaration of Helsinki and was approved by the Ethics Committee of the Autonomous University of Chile (CEC 2320).

Conflict of Interest Statement

The authors declare that there are no conflicts of interest related to this study. No financial benefits or institutional support have been received that could influence the results or interpretation of the data presented in this manuscript.

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Authors' Contribution

Conceptualization: Catalina Muñoz-Strale. Methodology: Catalina Muñoz-Strale. Software: Andrés Mendiburo. Validation: Catalina Muñoz-Strale, Frano Giakoni-Ramírez & Andrés Godoy-Cumillaf. Formal Analysis: Andrés Mendiburo. Investigation: Catalina Muñoz-Strale. Resources: Catalina Muñoz-Strale. Data Curation: Catalina Muñoz-Strale. Writing – Original Draft: Catalina Muñoz-Strale. Writing – Review & Editing: Frano Giakoni-Ramírez, Josivaldo de Souza-Lima & Andrés Godoy-Cumillaf. Visualization: Catalina Muñoz-Strale. Supervision: Catalina Muñoz-Strale. Project Administration: Catalina Muñoz-Strale. Funding Acquisition: Not applicable. All authors have read and agree with the published version of the manuscript.

Data Availability Statement

The data that support the findings of this study are available on request from the corresponding author catalina.munoz@unab.cl.

References

Akram, U., Ypsilanti, A., Gardani, M., Irvine, K., Allen, S., Akram, A., Drabble, J., Bickle, E., Kaye, L., Lipinski, D., Matuszyk, E., Sarlak, H., Steedman, E., & Lazuras, L. (2020). Prevalence and psychiatric correlates of suicidal ideation in UK university students. *Journal of Affective Disorders, 272*, 191–197. https://doi.org/10.1016/j.jad.2020.03.185

Antúnez, Z., & Vinet, E. V. (2012). Escalas de Depresión, Ansiedad y Estrés (DASS - 21): Validación de la versión abreviada en estudiantes universitarios Chilenos. *Terapia Psicológica, 30*(3), 49–55. https://doi.org/10.4067/s0718-48082012000300005

Auerbach, R. P., Alonso, J., Axinn, W. G., Cuijpers, P., Ebert, D. D., Green, J. G., Hwang, I., Kessler, R. C., Liu, H., Mortier, P., Nock, M. K., Pinder-Amaker, S., Sampson, N. A., Aguilar-Gaxiola, S., Al-Hamzawi, A., Andrade, L. H., Benjet, C., Caldas-de-Almeida, J. M., Demyttenaere, K., … & Bruffaerts, R. (2016). Mental disorders among college students in the world health organization world mental health surveys. *Psychological Medicine, 46*, 2955–2970. https://doi.org/10.1017/S0033291716001665

Åvitsland, A., Leibinger, E., Haugen, T., Lerum, Ø., Solberg, R. B., Kolle, E., & Dyrstad, S. M. (2020). The association between physical fitness and mental health in Norwegian adolescents. *BMC Public Health, 20*, 776. https://doi.org/10.1186/s12889-020-08936-7

Barrera-Herrera, A., & San Martín, Y. (2021). Prevalencia de sintomatología de salud mental y hábitos de salud en una muestra de universitarios chilenos. *Psykhe, 30*(1), 1-16. https://doi.org/10.7764/psykhe.2019.21813

Bravo, D., Errázuriz, A., & Campos, D. (2022). *Termómetro de Salud Mental en Chile ACHS-UC: Quinta Ronda*. https://www.achs.cl/docs/librariesprovider2/noticias-2022/achs-127833/tms-ronda-5-conferencia.pdf

Cadenas-Sánchez, C., Mena-Molina, A., Torres-López, L.V., Migueles, J.H., Rodriguez-Ayllon, M., Lubans, D.R & Ortega, F.B. (2021). Healthier minds in fitter bodies: A systematic review and meta-analysis of the association between physical fitness and mental health in youth. *Sports Medicine, 51*, 2571–2605. https://doi.org/10.1007/s40279-021-01520-y

Caqueo-Urízar, A., Mena-Chamorro, P., Flores, J., Narea, M., & Irarrázaval, M. (2020). Problemas de regulación emocional y salud mental en adolescentes del norte de Chile. *Terapia psicológica, 38*(2), 203–222. https://dx.doi.org/10.4067/S0718-48082020000200203

de la Portilla, S., Dussán, C., Montoya, D. M., Taborda, J., & Nieto, L. S. (2018). Calidad de sueño y somnolencia diurna excesiva en estudiantes universitarios de diferentes dominios. *Hacia la Promoción de la Salud, 24*(1), 84–96. https://doi.org/10.17151/hpsal.2019.24.1.8

De Moraes, A. C. F., Vilanova-Campelo, R. C., Torres-Leal, F. L., & Carvalho, H. B. (2019). Is self-reported physical fitness useful for estimating fitness levels in children and adolescents? A reliability and validity study. *Medicina, 55*(6), 286. https://doi.org/10.3390/medicina55060286

Kljajević, V., Stanković, M., Đorđević, D., Trkulja-Petković, D., Jovanović, R., Plazibat, K., Oršolić, M., Čurić, M., & Sporiš, G. (2022). Physical Activity and Physical Fitness among University Students—A Systematic Review. *International Journal of Environmental Research and Public Health, 19*(1), 158. https://doi.org/10.3390/ijerph19010158

Faria, Y. de O., Gandolfi, L., & Moura, L. B. A. (2014). Prevalence of risk behaviors in young university students. *Acta Paulista de Enfermagem, 27*(6), 591–595. https://doi.org/10.1590/1982-0194201400096

Gerber, M., & Pühse, U. (2009). Review article: Do exercise and fitness protect against stress-induced health complaints? A review of the literature. *Scandinavian Journal of Public Health, 37*(8), 801–819. https://doi.org/10.1177/1403494809350522

Guzmán-Muñoz, E., González-Cerpa, C., Olivares-Neira, C., Salazar-Orellana, C., Corredor-Serrano, L. F. & Alarcón-Rivera, M. (2024). Relación entre la percepción de condición física y medidas antropométricas auto reportadas en estudiantes universitarios. *Revista Ciencias de la Actividad Física UCM, 25*(1), 1-14. https://doi.org/10.29035/rcaf.25.1.2

Herbert, C., Meixner, F., Wiebking, C., & Gilg, V. (2020). Regular physical activity, short-term exercise, mental health, and well-being among university students: The results of an online and a laboratory study. *Frontiers in Psychology, 11*, 509. https://doi.org/10.3389/fpsyg.2020.00509

Hong, Y., Shen, J., Hu, Y., Gu, Y., Bai, Z., Chen, Y., & Huang, S. (2024). The association between physical fitness and mental health among college students: A cross-sectional study. *Frontiers in Public Health, 12*, 1384035. https://doi.org/10.3389/fpubh.2024.1384035

Janssen, A., Leahy, A. A., Diallo, T. M. O., Smith, J. J., Kennedy, S. G., Eather, N., Mavilidi, M. F., Wagemakers, A., Babic, M. J., & Lubans, D. R. (2020). Cardiorespiratory fitness, muscular fitness, and mental health in older adolescents: A multi-level cross-sectional analysis. *Preventive Medicine, 132*, 105985. https://doi.org/10.1016/j.ypmed.2020.105985

Lee, E., & Kim, Y. (2018). Effect of university students' sedentary behavior on stress, anxiety, and depression. *Perspectives in Psychiatric Care, 55*(2), 164–169. https://doi.org/10.1111/ppc.12296

Marques, A., Mota, J., Gaspar, T., & Gaspar de Matos, M. (2017). Associations between self-reported fitness and self-rated health, life satisfaction, and health-related quality of life among adolescents. *Journal of Exercise Science & Fitness, 15*(1), 8–11. https://doi.org/10.1016/j.jesf.2017.03.001

Mayorga-Vega, D., Parra Saldías, M., & Viciana, J. (2019). Condición física, actividad física, conducta sedentaria y predictores psicológicos en adolescentes chilenos: Diferencias por género. *Cultura, Ciencia y Deporte, 14*(42), 233–241. https://doi.org/10.12800/ccd.v14i42.1337

Merellano-Navarro, E., Bustamante-Ara, N., Russell-Guzmán, J., Lagos-Hernández, R., Uribe, N., & Godoy-Cumillaf, A. (2022). Association between sleep quality and physical activity in physical education students in chile in the pandemic context: A cross-sectional study. *Healthcare, 10*(10), 1930. https://doi.org/10.3390/healthcare10101930

Muñoz Strale, C., Giakoni-Ramírez, F., Pinochet, F., Godoy-Cumillaf, A., Fuentes-Merino, P., & Duclos-Bastías, D. (2024). Condición física, actividad física y calidad de vida en estudiantes universitarios chilenos. *Retos. Nuevas Tendencias en Educación Física, Deporte y Recreación, 56*, 521–530. https://doi.org/10.47197/retos.v56.104184

Nguyen#Michel, S. T., Unger, J. B., Hamilton, J., & Spruijt#Metz, D. (2006). Associations between physical activity and perceived stress/hassles in college students. *Stress and Health*, 22(3), 179–188. https://doi.org/10.1002/smi.1094

Olivares, P. R., Garcia Rubio, J., & Merellano-Navarro, E. (2017). Propiedades psicométricas de la escala "International Fitness Scale" en adolescentes chilenos. *Retos. Nuevas Tendencias en Educación Física, Deporte y Recreación, 31*, 23–27. https://doi.org/10.47197/retos.v0i31.44060

Ortega, F. B., Ruiz, J. R., España-Romero, V., Vicente-Rodriguez, G., Martínez-Gómez, D., Manios, Y., Béghin, L., Molnar, D., Widhalm, K., Moreno, L. A., Sjöström, M., Castillo, M. J., & Helena study group. (2011). The International Fitness Scale (IFIS): Usefulness of self-reported fitness in youth. *International Journal of Epidemiology, 40*(3), 701-711. https://doi.org/10.1093/ije/dyr039

Ortega, F. B., Sánchez-López, M., Solera-Martínez, M., Fernández-Sánchez, A., Sjöström, M., & Martínez-Vizcaino, V. (2013). Self-reported and measured cardiorespiratory fitness similarly predict cardiovascular disease risk in young adults. *Scandinavian Journal of Medicine & Science in Sports, 23*(6), 749–757. https://doi.org/10.1111/j.1600-0838.2012.01454.x

Peña-Ibagon, J. C., Rodríguez-Becerra, D., Rincón-Vásquez, F. J., & Castillo-Daza, C. A. (2021). Relación entre los niveles de actividad física y la condición física autopercibida en una muestra de estudiantes universitarios en Bogotá, Colombia. *Fisioterapia, 43*(6), 340–346. https://doi.org/10.1016/j.ft.2021.03.005

Ribeiro, S., & Stickgold, R. (2014). Sleep and school education. *Trends in Neuroscience and Education, 3*(1), 18–23. https://doi.org/10.1016/j.tine.2014.02.004

Romero#Gallardo, L., Soriano#Maldonado, A., Ocón#Hernández, O., Acosta#Manzano, P., Coll#Risco, I., Borges#Cosic, M., Ortega, F. B., & Aparicio, V. A. (2019). International Fitness Scale—IFIS: Validity and association with health#related quality of life in pregnant women. *Scandinavian Journal of Medicine & Science in Sports, 30*(3), 505–514. https://doi.org/10.1111/sms.13584

Santomauro, D. F., Herrera, A. M. M., Shadid, J., Zheng, P., Ashbaugh, C., Pigott, D. M., et al. (2021). Global prevalence and burden of depressive and anxiety disorders in 204 countries and territories in 2020 due to the COVID-19 pandemic. *Lancet, 398*, 1700–1712. https://doi.org/10.1016/S0140-6736(21)02143-7

Schultchen, D., Reichenberger, J., Mittl, T., Weh, T. R. M., Smyth, J. M., Blechert, J., & Pollatos, O. (2019). Bidirectional relationship of stress and affect with physical activity and healthy eating. *British Journal of Health Psychology, 24*(2), 315–333. https://doi.org/10.1111/bjhp.12355

Sheldon, E., Simmonds-Buckley, M., Bone, C., Mascarenhas, T., Chan, N., Wincott, M., Gleeson, H., Sow, K., Hind, D., & Barkham, M. (2021). Prevalence and risk factors for mental health problems in university undergraduate students: A systematic review with meta-analysis. *Journal of Affective Disorders, 287*, 282–292. https://doi.org/10.1016/j.jad.2021.03.054

Silva-Ramos, M. F., López-Cocotle, J. J., & Meza-Zamora, M. E. C. (2020). Estrés académico en estudiantes universitarios. *Investigación y Ciencia de la Universidad Autónoma de Aguascalientes, 79*, 75–83. https://doi.org/10.33064/iycuaa2020792960

Spagert, L., Janssen, C., & Geigl, C. (2022). Mental health indicators and their lifestyle associations in German students: A gender-specific multivariable analysis. *BMC Public Health, 22*, 1413. https://doi.org/10.1186/s12889-022-13777-7

Suwannakul, B., Sangkarit, N., Manoy, P., Amput, P., & Tapanya, W. (2023). Association between stress and physical fitness of university students post-COVID-19 pandemic. *Journal of Functional Morphology and Kinesiology, 8*(1), 33. https://doi.org/10.3390/jfmk8010033

The jamovi project. (2024). *Jamovi* (Version 2.5) [Computer software]. https://www.jamovi.org

Thorley, C. (2017). *Not by degrees: Improving student mental health in the UK's universities*. IPPR. https://www.ippr.org/articles/not-by-degrees

Veiga de Cabo, J., Fuente Díez, E. de la, & Zimmermann Verdejo, M. (2008). Modelos de estudios en investigación aplicada: Conceptos y criterios para el diseño. *Medicina y Seguridad del Trabajo, 54*(210), 81-88. https://doi.org/10.4321/s0465-546x2008000100011

Wunsch, K., Fiedler, J., Bachert, P., & Woll, A. (2021). The tridirectional relationship among physical activity, stress, and academic performance in university students: A systematic review and meta-analysis. *International Journal of Environmental Research and Public Health, 18*(2), 739. https://doi.org/10.3390/ijerph18020739

Younes, F., Halawi, G., Jabbour, H., El Osta, N., Karam, L., Hajj, A., & Rabbaa Khabbaz, L. (2016). Internet addiction and relationships with insomnia, anxiety, depression, stress and self-esteem in university students: A cross-sectional designed study. *PLOS ONE, 11*(9), e0161126. https://doi.org/10.1371/journal.pone.0161126

Zhai, X., Wu, N., Koriyama, S., Wang, C., Shi, M., Huang, T., Wang, K., Sawada, S. S., & Fan, X. (2021). Mediating effect of perceived stress on the association between physical activity and sleep quality among Chinese college students. *International Journal of Environmental Research and Public Health, 18*(1), 289. https://doi.org/10.3390/ijerph18010289

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