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Predictive Model of Anxious and Depressive Symptoms Based on the Relationship Between Hardiness and Academic Adaptation

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ABSTRACT – The main objective of this study was to test an explanatory model for anxiety and depressive symptoms using hardiness as a predictor variable and academic adaptation as a mediating variable. The sample included 207 students from the health area. The instruments used were the Academic Experiences Questionnaire, the Hardiness Scale, the Patient Health Questionnaire-9 Scale, the Generalized Anxiety Disorder Scale - 7, and a sociodemographic data questionnaire. The results showed that the explanatory model for anxiety and depression in the academic context was satisfactory. It was found that the personal dimension of adaptation was a mediating factor in the relationship between hardiness and outcomes. "In conclusion, possibilities for interventions and theoretical contributions were discussed.

KEYWORDS: hardiness; anxiety; depression; academic adaptation.

Modelo Preditivo dos Sintomas Ansiosos e Depressivos com Base na Relação Entre Hardiness e Adaptação Acadêmica

RESUMO – O presente estudo teve como objetivo principal testar um modelo explicativo para os sintomas ansiosos e depressivos, tendo o *hardiness* como variável preditora e a adaptação acadêmica como variável mediadora. Participaram do estudo 207 estudantes da área de saúde. Os instrumentos utilizados foram o Questionário de Vivências Acadêmicas, a Escala *Hardiness*, a Escala *Patient Health Questionnaire-9*, a Escala *Generalized Anxiety Disorder* - 7 e um questionário de dados sociodemográficos. Os resultados demonstraram que o modelo explicativo para a ansiedade e depressão no contexto acadêmico foi satisfatório. Constatou-se que a dimensão pessoal da adaptação foi um fator mediador da relação entre o *hardiness* e os desfechos. Ao final, possibilidades de intervenções e contribuições teóricas foram apontadas.

PALAVRAS-CHAVE: hardiness; ansiedade; depressão; adaptação acadêmica.

The university population has been identified as one of the demographic groups most affected by common mental disorders, particularly anxiety and depression (Lelis et al., 2020; Soares et al., 2020). Among this group, students from healthcare-related fields have garnered attention from researchers due to their heightened vulnerability to developing these disorders compared to those in other fields (Alves, 2014; Leão et al., 2018; Santiago et al., 2021). This phenomenon is attributed to the unique adaptive challenges of the academic environment compounded by those of emerging adulthood, a phase that most students are experiencing (Oliveira-Monteiro, 2021).

The adaptive demands individuals encounter upon entering the university environment are numerous and typically categorized into five main areas: personal, interpersonal, study-related, career-related, and institutional (Almeida et al., 2000; Ariño & Bardagi, 2018). It is important to note that certain aspects of academic life place a more significant adaptive burden on specific dimensions than others. For instance, certain aspects of healthcare students' education may expose them to specific stressors (Lima et al., 2019; Santiago et al., 2021), as well as students entering institutions that employ active learning methodologies (Marin et al., 2010; Bento et al., 2017; Torres, et al., 2019). These

heightened adaptive burdens in certain contexts can predict higher levels of mental health issues, a topic of significant interest among scholars in the field.

Concerning health sciences students, the main specific stressors in this field include excessive workload, competitiveness, constant pressure for high performance, and exposure to disease and death (Alves, 2014; Lima et al., 2019; Sacramento et al., 2021). As for students of active learning methodologies, the literature describes elements such as abrupt change in teaching methodology, demand for new cognitive and behavioral skills in learning, and study organization, as well as time management (Marin et al., 2010; Torres et al., 2019). This stressor related to methodological adaptation has been associated in some studies with high levels of anxiety (Bento et al., 2017), insecurity, and distress (Marin et al., 2010; Torres et al., 2019), as well as negative impacts on an individual's quality of life (Araújo et al., 2021). Considering primarily the considerable growth of institutions adopting this type of methodology (Sousa & Leal, 2017), these data indicators underscore the need for further investigations into the real impact of this potential stressor on the adjustment process and mental health of university students.

In the academic environment, certain types of adversities, often specific to the particularities of academic disciplines and modes of teaching in higher education, are believed to increase vulnerability to psychological disorders. This makes some subgroups of university students more susceptible to such illnesses (Alves, 2014). Therefore, it is important to understand how individuals cope with stressful situations and their outcomes related to physical and mental health, aiming to identify the elements that best predict potential problems. In this regard, there is also the mediation of some factors, including psychological factors.

The attribution of meaning and coping mechanisms in the face of stressful events, which affect how individuals perceive and behave in these situations, are crucial in determining their effects. Thus, the same event can trigger different response mechanisms, assuming various forms and intensities depending on those experiencing it (Carver & Vargas, 2011; O´Connor, et al., 2021; Robinson, 2018). Personality profiles are one of the psychological aspects that influence this subject-environment relationship. In this field, the personality profile known as hardiness has stood out for its predictive potential regarding the psychological consequences of an adverse environment.

Hardiness can be defined as a personality profile formed by the interrelation of commitment, control, and challenge factors, which encompass specific cognitive and behavioral processes. Commitment refers to the ability to engage fully in all aspects of life. Control involves the individual's belief in their capability to influence events. Challenge corresponds to the perception that changes are a normal aspect of life and an opportunity for personal growth. Together, these factors interact to potentially mitigate the effects of stress and shape individuals' responses to stressors, making hardiness a crucial resilience resource during adversity (Ver Kobasa, 1979; Kobasa, et al., 1982; Maddi, 2021).

Regarding university students, research has shown that hardiness serves as an important protective resource against the impacts of stressors in academic settings. High levels of hardiness have been linked to improved health, quality of life, academic performance, and lower dropout rates (Kobasa, et al., 1982; Maddi et al., 2009; Maddi, 2021). This construct has demonstrated predictive power, particularly with anxiety and depressive symptoms among university students (Bolzan, 2012; Freitas, 2012; Grazziano et al., 2015; Likhacheva, et al., 2013; Totskiy et al., 2021). Intervention studies aimed at enhancing characteristics of the hardiness profile through training have also yielded highly satisfactory results among university students (Hutami et al., 2020; Kobasa et al., 1982; Maddi et al., 2009).

In summary, what stands out in research on hardiness in the academic environment is its potential to modify students' adaptive experiences, mitigating the impact of stressors and thus improving adaptive outcomes. Therefore, hardiness emerges as a promising variable for integrating explanatory models of academic adaptation, anxiety, and depression. Modifying hardiness is believed to influence adaptation status and symptomatology, suggesting its potential as a reference for guiding psychological interventions.

Considering the relationships mentioned, it is important to note the lack of studies testing the predictive power of psychological variables and the need to understand the factors that explain common complaints among students through the analysis of aspects related to the academic context and individual differences between students. Additionally, it is crucial to identify variables influencing academic outcomes related to anxiety and depression. It should be noted that hardiness is being studied as a prophylactic construct against anxiety and depression regarding isolated symptoms rather than diagnosed disorders, but this may indicate important vulnerability factors for developing such disorders.

The present study aimed to test a predictive model of anxious and depressive symptoms, with hardiness as the predictor variable and academic adaptation as the mediating variable, across various academic contexts involving health sciences students. To achieve this, the study measured students' levels of anxious and depressive symptomatology, assessed their levels of academic adaptation, analyzed the relationship between hardiness and academic contexts, and investigated the interactions among hardiness, academic adaptation, anxious symptoms, and depressive symptoms. It is important to emphasize that this study focused specifically on these themes, employing psychometric instruments for evaluation.

METHOD

Participants

The study included 207 health sciences students from two campuses of the Universidade Federal de Sergipe (UFS): Lagarto and São Cristóvão. The average age was 23.1 years (SD = 4.14). Students from the Lagarto campus comprised 40.6% of the sample, while those from São Cristóvão comprised 59.4%. The segmentation of the samples by campus was based on the teaching model, with São Cristóvão adopting the traditional model and Lagarto employing active learning methodologies. Convenience sampling was used via an online survey format. The sample selection criteria included students enrolled in nursing, pharmacy, physiotherapy, speech therapy, medicine, nutrition, and dentistry courses, all aged over 18 years old. This research received approval from the Research Ethics Committee of the University Hospital at Universidade Federal de Sergipe (CAAE: 51766121.2.1001.5546).

Instruments

A sociodemographic and academic data questionnaire was administered, covering topics such as age, gender, family income, marital status, whether they had children, employment status, living arrangements, place of birth, current city of residence, whether they had to relocate for their studies, course, campus (Lagarto or São Cristóvão), cycle/period, and study shift.

To assess academic adaption, the *Questionário de Vivências Acadêmicas* (Academic Experience Questionnaire – reduced version) was used (QVA-r; Almeida, et al., 2000; Granado et al., 2005). The QVA is a self-report instrument consisting of subscales and 55 items with Likert-type scores ranging from 1 (does not apply to me at all) to 5 (applies to me completely). Its reduced version includes five dimensions, related to areas of academic adaptation: personal, interpersonal, career, study, and institutional. The values for internal consistency in the validation study were adequate, with Cronbach's alphas for the dimensions ranging from 0.71 to 0.91 and 0.88 for the overall scale. In this study, the reliability analysis of the instrument for the five dimensions showed a very satisfactory result, with Cronbach's alphas (α) ranging from 0.70 to 0.92 and McDonald's omegas (Ω) ranging from 0.70 to 0.92, while the overall scale obtained 0.94 on both indicators.

The Hardiness Scale (Bartone et al., 1989; Serrano, 2009) was used to assess levels of hardiness. This scale aims to evaluate the extent to which individuals exhibit hardy attitudes when faced with stressful situations. It is a Likert-type scale, ranging from 0 (not true at all) to 3 (completely true). The scale comprises 30 items distributed across three domains: Commitment, Control, and Challenge. The internal consistency values in the validation study were found to be adequate, with Cronbach's alphas for the overall scale at 0.73. Specifically, Commitment had a Cronbach's alpha of 0.68, Control of 0.63, and Challenge, of 0.44. In the current study, the internal consistency levels for the overall scale were $\alpha = 0.78$ and $\Omega = 0.76$; the Commitment domain showed $\alpha = 0.74$ and $\Omega = 0{,}72$; and Control had α and $\Omega = 0.60$; and Challenge showed $\alpha = 0.50$ and $\Omega = 0.60$.

To screen for anxiety symptoms, the Generalized Anxiety Disorder Scale (GAD-7; Moreno et al., 2016; Spitzer et al., 2006) was administered. This instrument is a brief questionnaire used for the evaluation, diagnosis, and monitoring of anxiety based on the diagnostic criteria for the DSM-IV. It is a Likert-type scale consisting of seven items that measure the frequency of anxiety signs and symptoms over the past two weeks, using a four-point scale ranging from 0 (not at all) to 3 (nearly every day). A cut-off score of 10 is stipulated to indicate the significance of GAD symptoms (Spitzer et al., 2006). In this sample, the scale demonstrated a Cronbach's alpha and McDonald's omega of 0.90.

Lastly, to screen for depressive symptoms, the Patient Health Questionnaire-9 (PHQ-9; Kroenke, et al., 2001; Lima et al., 2009) was used. This questionnaire is based on the diagnostic criteria for major depressive disorder from the DSM-IV. It is a Likert-type scale consisting of nine items that measure the frequency of depression signs and symptoms over the past two weeks, ranging from 0 ("not at all") to 3 ("nearly every day"), with a cut-off score of 10 indicating the presence of depressive symptoms. The instrument demonstrated a Cronbach's alpha of 0.85 in the validation study in Brazil. In this investigation, the scale presented a value of 0.89 for both Cronbach's alpha and McDonald's omega.

Procedures

The research data were collected virtually, individually, and using self-administration. The data collection took place in July 2022 and the entire research process lasted approximately four months. The questionnaires were sent via email with a link to the Survey Monkey platform. On the first page of the online form, the Informed Consent Form (ICF) was presented, and only after confirming consent could the individual proceed to answer the research questionnaire.

Data Analysis

We used the JASP 0.16.2 for data analysis. Descriptive analyses (mean [M] and standard deviation [SD]) were conducted for sociodemographic and academic variables, as well as for the total scores of the scales used (QVA-r, Hardiness Scale, GAD-7, PHQ-9). In bivariate analyses,

the Student's t-test was applied to verify differences in instrument scores according to campus, as well as correlations between all constructs and their relationship with outcomes. Correlations were used to assess the assumption of the mediation test, as all variables included in the model must have statistical significance (Baron & Kenny, 1986). The significance level for all analyses was set at $p<0.05$.

To map the relationships between hardiness, adaptation, anxiety, and depression, an explanatory model was developed and analyzed using Path Analysis through mediation analysis. The model evaluation examined direct, indirect, and total effects, as well as the explained variance (R^2). All parameter estimates were assessed using the Robust Diagonally Weighted Least Squares (RDWLS) method.

RESULTS

Descriptive and bivariate analyses

The assessment of adaptation, hardiness, anxiety, and depression in the sample is presented in Table 1, which shows the mean scores and standard deviations of the subscales, as well as the minimum and maximum possible and obtained scores. It is important to highlight that, in the GAD-7 and PHQ-9, 58.5% (n=121) of the sample scored above the cut-off point.

When comparing the variables of adaptation [t(205)=1.045; p=0.297; d=0.148], hardiness [t(205)=0.936; p=0.350; d=0.133], anxiety [t(205)=0.105; p=0.917; d=0.015], and depression [t(205)=0.951; p=0.343; d=0.135] by campus, no statistically significant differences were observed ($p>0.05$). In other words, there was no difference by campus for any of the evaluated constructs. Subsequently, correlations between the factors of hardiness, the dimensions of QVA, and the outcomes (anxiety and depression) were analyzed, as presented in Table 2. It was found that, essentially, all were statistically significant ($p<0.01$). There were three exceptions in these regressions: the relationships between the challenge factor of hardiness and the dimensions of career, study, and institutional were not statistically significant ($p>0.05$).

Table 1.
Descriptive Results of the Instruments

Instruments	M	SD	Min-Max*	Min-Max**
GAD	11.1	5.91	0-21	0-21
PHQ	12.3	6.81	0-27	0-27
Personal QVA	36.6	11.35	14-69	14-70
Interpersonal QVA	39.3	9.24	15-60	12-60
Career QVA	42.8	8.80	20-60	12-60
Study QVA	29.6	6.04	11-43	9-45
Institutional QVA	29.1	4.50	17-40	8-40
General QVA	177.6	28.70	92-261	55-275
Hardiness Commitment	19.3	4.50	4-30	0-30
Hardiness Control	19.0	3.85	6-29	0-30
Hardiness Challenge	11.9	3.46	4-20	0-30
Hardiness General	50.4	9.14	19-73	0-90

Note: * Minimum and maximum range obtained; ** Minimum and maximum range possible

Table 2.
Correlation between hardiness factors, QVA dimensions, GAD and PHQ

	Correlation between the factors									
Factors	F1	F2	F3	F4	F5	F6	F7	F8	F9	F10
H commitment	–	0.628^{c}	0.215^{b}	0.578^{c}	0.372^{c}	0.459^{c}	0.490^{a}	0.395^{c}	-0.404^{c}	-0.521^{c}
H control		–	0.299^{c}	0.578^{c}	0.329^{c}	0.388^{c}	0.513^{c}	0.290^{c}	-0.413^{c}	-0.480^{c}
H challenge			–	0.312^{c}	0.159^{a}	0.080	0.090	0.031	-0.283^{c}	-0.215^{b}
Personal QVA				–	0.316^{c}	0.368^{c}	0.528^{c}	0.316^{c}	-0.783^{c}	-0.806^{c}
Interpersonal QVA					–	0.348^{c}	0.345^{c}	0.506^{c}	-0.203^{b}	-0.241^{c}
Career QVA						–	0.355^{c}	0.473^{c}	-0.242^{c}	-0.314^{c}
Study QVA							–	0.323^{c}	-0.401^{c}	-0.443^{c}
Institutional QVA								–	-0.247^{c}	-0.303^{c}
GAD									–	0.808^{c}
PHQ										-

Note: a = $p<0.05$. b = $p<0.01$, c = $p<0.001$; H = Hardiness.

Testing the Predictive Model for Anxiety and Depressive Symptoms Based on the Relationship Between Hardiness and Academic Adaptation

The theoretical model tested had the hardiness factors as the predictor variable, the dimensions of the QVA as the mediator variable, and anxiety and depressive symptoms as the outcomes. When testing the model's fit, it was found that all relationships mediated by the interpersonal, career, study, and institutional dimensions of the QVA were not statistically significant (p>0.05). Subsequently, a final model was tested, eliminating the non-significant predictions for the sake of parsimony, which indicates that the simplest possible structure should be used to explain the outcome. Only the predictions mediated by the personal dimension of the QVA showed statistical significance, as indicated in Table 3. The result (final model) is demonstrated in Figure 1.

It is important to highlight some characteristics of the final model. Firstly, the explained variance (R^2) was 42.9% for the personal dimension of adaptation, 61.9% for anxiety, and 65.6% for depression. Secondly, all the mediated relationships were negative; that is, higher values of the hardiness factors – mediated by the personal dimension of the QVA – corresponded to lower values of anxiety and depression. Thirdly, although the direct effects of the hardiness factors on the outcomes were not statistically significant (p>0.05) in the initial model, all the total effects were statistically significant in the final model: commitment, control, and challenge in relation to anxiety, and commitment and control in relation to depression. In the challenge factor, the predictive path of hardiness regarding depression was the only aspect without statistical significance for the total effect in the final model.

In summary, the results demonstrated that hardiness factors alone were not predictive of anxiety and depressive symptoms in the tested model. However, when mediated by adaptation – specifically the Personal dimension –, they became protective factors.

Table 3.
Mediation analysis (final model)

Total Effects					**95% C.I.**	
	Estimate	**S. E.**	**z-value**	**p-value**	**Lower**	**Upper**
Hcommitment → GAD	-0.232	0.072	-3.205	0.001	-0.374	-0.090
Hcontrol → GAD	-0.216	0.073	-2.950	0.003	-0.360	-0.073
Hchallenge → GAD	-0.169	0.065	-2.608	0.009	-0.295	-0.042
Hcommitment → PHQ	-0.359	0.065	-5.519	< 0.001	-0.486	-0.231
Hcontrol → PHQ	-0.234	0.075	-3.136	0.002	-0.381	-0.088
Hchallenge → PHQ	-0.068	0.064	-1.062	0.288	-0.193	0.057
Direct Effects						
Hcommitment → GAD	0.055	0.062	0.887	0.375	-0.066	0.176
Hcontrol → GAD	0.045	0.061	0.745	0.456	-0.074	0.164
Hchallenge → GAD	-0.051	0.046	-1.112	0.266	-0.142	0.039
Hcommitment → PHQ	-0.089	0.049	-1.801	0.072	-0.186	0.008
Hcontrol → PHQ	0.011	0.063	0.180	0.857	-0.112	0.135
Hchallenge → PHQ	0.042	0.043	0.978	0.328	-0.043	0.127
Indirect effects						
Hcommitment → Personal QVA → GAD	-0.287	0.052	-5.485	< 0.001	-0.390	-0.185
Hcontrol → Personal QVA → GAD	-0.262	0.054	-4.820	< 0.001	-0.368	-0.155
Hchallenge → Personal QVA → GAD	-0.117	0.048	-2.443	0.015	-0.211	-0.023
Hcommitment → Personal QVA → PHQ	-0.270	0.050	-5.439	< 0.001	-0.367	-0.173
Hcontrol → Personal QVA → PHQ	-0.246	0.051	-4.840	< 0.001	-0.345	-0.146
Hchallenge → Personal QVA → PHQ	-0.110	0.045	-2.422	0.015	-0.199	-0.021

Note: S.E.= Standard Error; C.I.= confidence interval; H = Hardiness

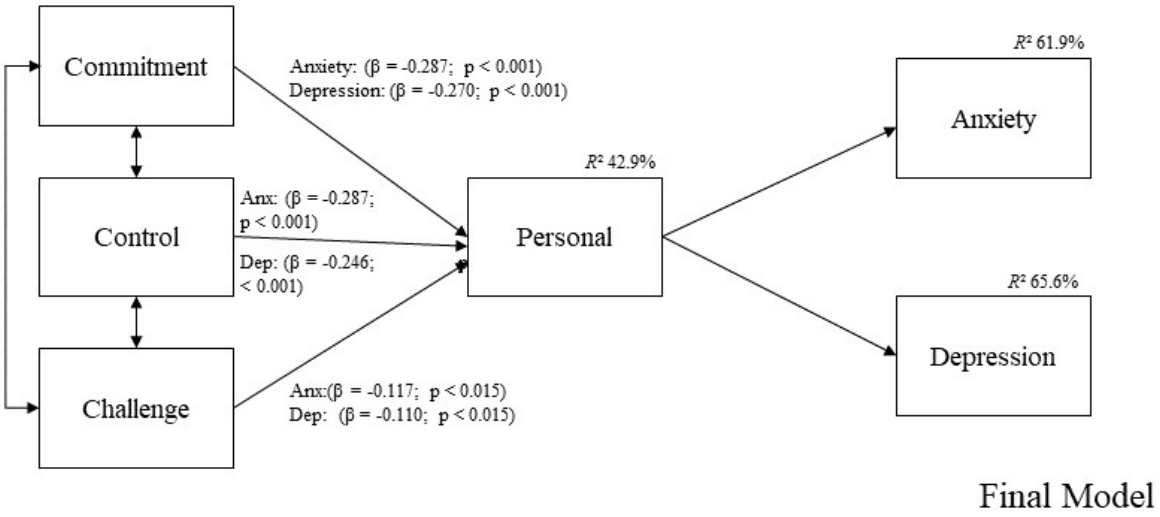

Figure 1. Theoretical Final Model of Anxious and Depressive Symptoms Based on the Relationship between Hardiness and Academic Adaption.
Notes: 1. All arrows represent statistically significant relationships in the bivariate analysis.

DISCUSSION

The primary aim of this study was to test a predictive model of anxiety and depressive symptoms, with hardiness as the predictor variable and academic adaptation as the mediator variable in academic contexts with different teaching methodologies. Additionally, the study sought to compare levels of anxiety, depression, hardiness, and academic adaptation across campuses, i.e., by the type of teaching methodology adopted at each location. Overall, it is important to highlight that the main finding is that the final model achieved was satisfactory, as it successfully explained a significant portion of the outcomes, thereby making important contributions to the studied theme.

Regarding adaptation, it was found that the average overall score of the QVA-r (177.6 points) was higher than the scale's midpoint (137.5 points). Therefore, half of the sample presented adaptation levels above 50% of the possible score on the scale. The dimensions also had averages above their respective midpoints, with the career dimension having the highest average (42.8 points). Higher scores in the career dimension indicate good levels of satisfaction with the course, career, and personal competence perception to perform it (Igue et al., 2008). It is worth noting that this pattern has been found in other studies, with averages above the cutoff point and a highlight on the career dimension (Carleto, et al., 2018; Gomes & Silva, 2021; Oliveira & Morais, 2015; Soares et al., 2022).

It is important to emphasize some specificities of the current historical moment, especially with the beginning of the resumption of in-person activities post-pandemic and the various stressors associated with this period, which may have impacted the academic adjustment indices in this research. One example is the need for readaptation to in-person teaching. The changes required by the transition from remote to in-person teaching in various aspects of an individual's life and the management of uncertainties still associated with the pandemic period, among others, suggest that these factors may have influenced students' adaptive perceptions. Both in this research and in the literature (Carleto et al., 2018; Gomes & Silva, 2021; Granado et al., 2005; Soares et al., 2022), it is known that higher scores in the career dimension tend to indicate that vocational issues are the demands causing the least adaptive problems for Brazilian university students. In summary, this means that most students show good identification with their course and that conflicts regarding career changes occur less frequently compared to other stressors.

Similar to academic adaptation, it was observed that the average general score for hardiness (50 points) exceeded the instrument's midpoint (45 points), with all its factors doing the same except for the challenge factor (11.9 points), which fell below the midpoint (15 points). To be considered hardy, that is, an individual classified within the hardiness personality profile, an individual must score high in all the factors of the construct (Grazziano, et al., 2015). Therefore, despite the general score average being above the midpoint, most of the students in this study cannot be considered hardy, as the challenge factor had a low average. This finding aligns with the literature, where only a minority of individuals in samples are classified with the hardiness profile, with the challenge factor often scoring the lowest (Bolzan, 2012; Freitas, 2012; Galvão & Souza Neto, 2018; Grazziano et al., 2015). This finding is notable because, in studies, including this one, most individuals are not considered to possess the hardiness profile, with the challenge factor consistently having the lowest scores.

Throughout the development of hardiness theory, the challenge factor has consistently drawn certain reservations that may account for the differences found in various studies, including the present one, compared to the other factors of the construct. Despite the literature emphasizing that hardiness is a unitary construct characterized by the combined effects of its three interrelated factors, some researchers have tested the effects of the three factors separately. They found that the challenge factor tends to predict health outcomes less robustly and establishes significantly weaker relationships with the other factors (commitment and control) (Eschleman et al., 2010; Funk, 1992; Wiebe & Williams, 1992). This may explain why, in this sample focusing on mental health outcomes, the challenge factor was the only factor to score below the midpoint, consistent with the trend of low scores observed in other studies involving the construct and health variables. Therefore, these findings underscore the theoretical perspective that emphasizes the interconnectedness of the three factors of hardiness, highlighting the importance of not isolating them when conceptualizing the construct.

In this study, less than half of the sample scored above average levels in all hardiness factors, aligning with findings in the literature regarding the university population (Bolzan, 2012; Freitas, 2012). Overall, this indicates that a significant portion of students exhibit low levels of the hardiness personality profile, which may be a vulnerability factor for illness. Although some research does not indicate this relationship (Ivaskevych et al., 2020; Kovács & Borcsa, 2017), hardiness is considered an important protective factor against stressors in the academic context (Abbasi et al., 2020; Likhacheva et al., 2013; Tho, 2019). In the case of anxiety and depressive disorders, it would function as a mitigating factor for symptomatology, reducing the likelihood of these symptoms occurring due to difficulties in adaptation in this environment.

It is important to highlight that hardiness is considered a dynamic personality trait rather than a static one, meaning it is developed throughout an individual's life because of interactions with the environment and coping with adverse situations (Kobasa, 1979; Kobasa et al., 1982). Consequently, the potential for developing these characteristics through training is already evidenced in the literature, including studies involving university students (Hutami et al., 2020; Kobasa et al., 1982; Maddi et al., 2009). Therefore, the study of this profile, still limited at the national level, and the integration of explanatory models, are promising as effective tools for academic adjustment and, consequently, the reduction of the high levels of anxiety and depression that affect this population.

Regarding anxiety, the average total score on the GAD-7 was 11.1 (SD=5.91). For depression, the average score on the PHQ-9 was 12.3 (SD=6.81). On both scales, which have a cutoff point of 10, it was observed that about 60% of the sample scored above this threshold. These data suggest that a portion of the students in this study exhibited significant symptomatology for anxiety and depressive disorders. This result aligns with the literature on the high prevalence of anxiety and depression levels, as well as other psychological disorders, among university students in the health sciences, showing higher rates compared to the general population (Leão et al., 2018; Lelis et al., 2020; Lima et al., 2019; Sacramento et al., 2021).

The transition to higher education involves changes and new challenges, requiring the individual to adapt to various aspects of life. The demands of university life, combined with the transition to adulthood, make this period critical and the peak of academic stress. Therefore, it is a potentially stressful phase and a predictor of psychological repercussions (Oliveira-Monteiro, 2021). Given these data and the typical nature of this experience in a young person's life, it is fundamental to identify protective or risk factors for illness. This consideration – in the design of the present investigation – reinforces the proposal to consider hardiness as a psychological variable related to adjustment in the academic context.

One of the premises of this work was to test whether there is a difference between the variables by campus, as this could evaluate if there is a divergence in the levels of mental suffering and adaptation among students of different teaching methodologies. It also aimed to determine whether students with stronger hardiness characteristics tend to adapt better to the context of active methodologies. Some studies associate the context of active teaching methodologies with higher rates of mental illness (Araújo et al., 2021; Bento et al., 2017; Dias et al., 2021; Maia et al., 2020; Marin et al., 2010; Surh, 2016; Torres et al., 2019). However, other studies have not found significant differences concerning mental illness between students of active and traditional methodologies (Lima et al., 2015; Montenegro-Pires & Sousa, 2022; Paixão, 2019; Sales, 2019; Tenório et al., 2016). This question arises from the issue surrounding the methodological transition, which often occurs abruptly (Marin et al., 2010; Surh, 2016).

In the present study, no statistically significant differences were found between the two institutions with different teaching methodologies. This means that the stressor related to the methodological transition did not result in higher levels of mental suffering and adaptive difficulties among the students experiencing it, as indicated by some of the studies cited above. In terms of anxiety, depression, and adaptation indices, the students from both institutions were similar (no statistically significant difference). Consequently, this finding suggests that a single intervention could be applied to both campuses, with no evidence that the methodology is an element that differentiates adaptation.

In summary, considering the indication of the focus for potential interventions from previous analyses, the explanatory model involving the factors of hardiness, dimensions of adaptation, anxiety, and depression was tested. This test aimed to understand what could constitute the emphasis of actions to reduce levels of mental suffering

and increase academic adaptation indices. A satisfactory final explanatory model was obtained, with an explained variance of just over 60%, which is considered high (Dancey & Reidy, 2019). The analysis found that the hardiness factors alone were not predictive of anxious and depressive symptoms, having influence only through the mediation of the personal adaptation dimension, which was the only dimension of the QVA that obtained statistical significance in the tested model. That is, satisfactory scores in the three factors that comprise hardiness were not directly related to lower or higher levels of anxiety and depression. Furthermore, the intensity of the hardiness personality trait alone did not have a protective effect against mental illness in this study, revealing the essential role of the mediating variable.

It was found, then, that the hardiness profile only reduced anxious and depressive symptoms when it improved the quality of adaptation in the personal dimension. This, in turn, indicates students' perception of their physical and psychological well-being, emotional balance, optimism, and self-confidence (Granado et al., 2005). Thus, the results in this sample indicated that anxiety and depression scores in the academic context are indirectly predicted by the impact of hardiness personality scores through their direct relationship with the level of adaptation in the personal dimension.

Regarding these relationships between hardiness, university life, and mental health, there is evidence in the literature that university students who have high scores on the hardiness profile tend to adapt better to university life. It has been directly related to better levels of performance and academic success, and in terms of mental health, it has been associated with lower levels of mental illness (Abbasi et al., 2020; Likhacheva et al., 2013; Tho, 2019). Thus, this research confirmed what other studies have already indicated about the success of hardiness in protecting students from mental illness in the academic context. Furthermore, it provided evidence that the negative relationship between hardiness and mental health outcomes in this environment occurs essentially through the mediation of personal adaptation factors.

In relation to the emphasis on the personal adaptation dimension as a mediator between hardiness and outcomes, some research findings can help explain this. For example, a meta-analysis study indicated that hardiness was positively associated with variables such as self-esteem, optimism, extroversion, sense of coherence, and self-efficacy. Additionally, it was negatively associated with neuroticism, negative affectivity, trait anxiety, and depression (Eschleman et al., 2010). Other studies have indicated the strategies through which the hardiness profile enables individuals to effectively cope with adverse events, some of the main ones being positive perception of the stressor, problem-focused coping strategies, and health behaviors (Maddi, 2021; Wiebe & Williams, 1992). As can be seen, both the variables with which hardiness is positively associated and the methods used for coping with stress are essentially intra-individual factors, which could justify the emphasis on the personal dimension of adaptation as a mediator concerning outcomes.

In summary, the final model demonstrated important theoretical contributions to the literature on academic adaptation and hardiness by reinforcing evidence of its efficacy as a construct capable of mitigating negative psychological repercussions in the academic environment and by identifying the mediating nature of this relationship. It also allows for the formulation of strategies for potential interventions aimed at enhancing students' adaptive experience and mitigating impacts on mental health.

It is important to highlight some limitations of this research. The use of a non-probabilistic and convenience sampling technique complicates the generalization of the results. Therefore, caution is needed when directly applying these findings to the interpretation of other academic contexts. If the contexts are similar, the bias may be reduced; however, significant differences require reservations based on the sampling design disparities. Additionally, variables related to COVID-19 were not considered in the study, which would have been pertinent given that data collection occurred during the early phase of the gradual return to in-person activities. However, the pandemic context was considered a possible explanation for the academic adaptation indices obtained in this study. Nonetheless, since these variables were not objectively measured, we recommend that future studies, if feasible, map the selective impact of pandemic-related variables, since this study operated on the assumption that the pandemic served as the backdrop for the data obtained. Therefore, the findings are situated within the pandemic scenario at a particular stage of its cycle and do not assess this scenario in its specificities. Moreover, no information was collected regarding any prior diagnosis of mental disorders among participants. This could potentially impact the research results, requiring caution in interpretation and serving as a suggestion for the design of future studies.

Overall, considering that the explained variance obtained for anxiety and depressive symptoms in the academic context was about 60%, it is understood that there are still 40% that need to be investigated. In other words, other variables influencing mental health outcomes in university students were not covered by the final model of this study and require further investigation. Therefore, as suggestions for the continuation of studies on the topic, it is deemed pertinent to investigate the impact of other constructs or variables associated with academic adjustment difficulties, such as analysis by course and by the stage of the course. It is recommended that other areas already highlighted in the literature on the subject be involved, as this would allow for the construction of theoretical models that address the explanatory portion not reached in this research, which was not the objective of the present investigation. Consequently, new studies are essential to integrate the knowledge that has been developing regarding mental health in the academic context and hardiness as a protective factor.

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Conflict of interest
The authors have no conflicts of interest to declare.

Data availability statement
The data supporting the findings of this study can be requested from the corresponding author upon reasonable request.

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