GHQ-12 validity in Brazilian medical students

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Abstract:
Medical students' depressive symptoms prevalence concerns educators worldwide. These students are a very susceptible group in developing Common Mental Disorders (CMD). In this context, monitoring the health conditions of this population becomes a necessity. The General Health Questionnaire (GHQ-12) is the most used instrument to assess common mental disorders in the world but has not yet been validated for medical students in Brazil. This study aims to assess the validity of GHQ-12 for this population. Data from 431 students were collected and submitted to confirmatory factor analysis, which was carried out using a single factor and a bifactorial model of structural equations evaluated by multiple indicators of model adequacy. The results allowed the model adjustment to be considered good, in line with studies previously presented in other national and international investigations. The present research allows us to ensure the validity of this instrument for Brazilian medical students.
Keywords: Medical students, medical education, mental health, mental disorders.

Validade do GHQ-12 em estudantes de medicina brasileiros

Resumo:
A prevalência de sintomas depressivos em estudantes de medicina preocupa educadores em todo o mundo. Esses alunos são um grupo muito suscetível ao desenvolvimento de Transtornos Mentais Comuns (TMC). Nesse contexto, o monitoramento das condições de saúde dessa população torna-se uma necessidade. O *General Health Questionnaire* (GHQ-12) é o instrumento mais utilizado para avaliar transtornos mentais comuns no mundo, mas ainda não foi validado para estudantes de medicina no Brasil. Este estudo tem como objetivo avaliar a validade do GHQ-12 para essa população. Os dados de 431 alunos foram coletados e submetidos à análise fatorial confirmatória, realizada por meio de um único fator e um modelo bifatorial de equações estruturais avaliadas por múltiplos indicadores de adequação do modelo. Os resultados permitiram que o ajuste do modelo fosse considerado bom, em consonância com estudos anteriormente apresentados em outras investigações nacionais e internacionais. A presente pesquisa nos permite garantir a validade desse instrumento para estudantes de medicina brasileiros.
Palavras-Chaves: Estudantes de medicina, educação médica, saúde mental, transtornos mentais.

Validez de GHQ-12 en estudiantes de medicina brasileños

Resumen:
La prevalencia de síntomas depresivos en estudiantes de medicina preocupa a educadores de todo el mundo. Estos estudiantes son un grupo muy susceptible al desarrollo de Trastornos Mentales Comunes (TMC). En este contexto, el seguimiento de las condiciones de salud de esta población se convierte en una necesidad. El *General Health Questionnaire* (GHQ-12) es el instrumento más utilizado para evaluar trastornos mentales comunes en el mundo, pero aún no ha sido validado para estudiantes de medicina en Brasil. Este estudio tiene como objetivo evaluar la validez del GHQ-12 para esta población. Se recopilaron datos de 431 estudiantes y se sometieron a un análisis factorial confirmatorio, realizado utilizando un factor único y un modelo bifactorial de ecuaciones estructurales evaluadas por múltiples indicadores de adecuación del modelo. Los resultados permitieron considerar bueno el ajuste del modelo, en línea con estudios presentados previamente en otras investigaciones nacionales e internacionales. La presente investigación nos permite asegurar la validez de este instrumento para los estudiantes de medicina brasileños.
Palabras clave: Estudiantes de medicina, enseñanza de la medicina, salud mental, transtornos mentales.

INTRODUCTION

Mental health has been a constant concern of contemporary society. Studies that seek to identify the genesis of mental disorders, their prevalence, and possible forms of prevention and management are proposed, executed, and published in abundance worldwide (AUERBACH *et al.*, 2018; GUSTAVSON *et al.*, 2018).

Mental health is defined by the World Health Organization (WHO) as well-being in which individuals maintain the ability to realize their potentials, their work capacity, and manage daily stress. This notion of well-being is inseparable from the expanded concept of health. Its maintenance (or lack thereof) is linked to a huge variety of factors, ranging from morbid situations to socio-economic variables constituting a complex and multifaceted condition (SOUTO *et al.*, 2020).

In this context, Common Mental Disorders (CMDs) include nonpsychotic, psychiatric symptoms insufficient to reach a formal diagnosis, but enough to compromise the performance of daily activities (BJÖRK BRÄMBERG *et al.*, 2018). Irritability, difficulty to concentrate, and fatigue are the most recognized symptoms of the condition. A biosocial model was first proposed by Goldberg (1994) in a text in which he correlated CMDs to factors such as vulnerability, resilience, and biological variables while aligning them to movements of destabilization and restitution (with or without chemical mediation) of mental health.

The prevalence of depression symptoms in medical students worldwide is an unsettling phenomenon. According to Cybulski & Mansani (2017), students display wide variation rates, from 13.9% to 79%. A similar scenario is found in national surveys. A study conducted with medical students from Santa Maria (BENVEGNU; DEITOS; COPETTE, 1996), using the Self-Reporting Questionnaire (SRQ-20), revealed that the prevalence of CMDs from the first to the tenth semester of the course was 31.7%. Another study conducted in Pernambuco (FACUNDES; LUDEMIR, 2005) detected 34.1% of affected students, and in Botucatu (LIMA; DOMINGUES; CERQUEIRA, 2006) the prevalence among university students was 44.7%.

Facing an exhausting course fraught with potentially stressful situations, in which expectations and responsibilities progressively increase and accumulate tensions and anxieties that significantly affect their health, medical students are recognized as a population whose mental health presents a high rate of disorders when compared to the general population, a situation that can often repeat itself in their coming professional practice, in which exposure to stressors may be even greater (CONCEIÇÃO *et al.*, 2019). The pressure for adaptation at the beginning of the course, the need to assimilate a large amount of different contents in addition to the increasing perception of career difficulties, and a scarcity of time for social and family life contribute to the onset of emotional disorders in this population. The difficulty of these challenges increases in the clinical cycle (3rd and 4th years) when the frequency of outpatient activities makes the contact of students with patients more intense and the workload of medical school assignments is exhaustive. In addition, the trajectory of the course leads the student to a daily routine that imposes the need to develop interpersonal relationship skills, to deal with feelings of pain, suffering, and loss, within a context of relentless competitiveness, leisure deprivation and technical insecurity (MOIR *et al.*, 2018).

As students enter the internship, stressors intensify. Insecurities in the application of acquired knowledge, direct interaction with patients, exhaustively long shifts, gradual decrease in leisure time, and difficulty in choosing an area of medical specialization are factors pointed out by several studies to explain the higher prevalence of anxiety and depression symptoms in the last years of college (RAMÓN-ARBUÉS *et al.*, 2020; TIAN-CI QUEK *et al.*, 2019).

In this context, supporting and monitoring the health conditions of this population becomes a necessity. Among the different instruments used to assess mental health, the *General Health Questionnaire* (GHQ-12) is an easy-to-apply questionnaire (only 12 items) frequently used in research to assess the prevalence of common mental disorders. Although GHQ validation has been carried out in several studies in diverse populations (GOUVEIA *et al.*, 2010; PÉREZ *et al.*, 2020), a study has not yet been conducted that would allow the validation of this instrument for medical students in Brazil. Thus, the present study aimed to assess the validity of the GHQ-12 for the university population of the Brazilian medical area, contributing to the reliability and possibility of generalization of the data obtained from this segment.

METHOD

Participants

The present work derives from a census study conducted on medical students in a private institution of higher education in the countryside of the State of Rio de Janeiro, Brazil (ARAGÃO *et al.*, 2017). The study included 431 students distributed between the first and twelfth semester of the course.

Instrument

All participants provided answers to a Brazilian Portuguese version of the GHQ-12 (GOUVEIA *et al.*, 2003) questionnaire composed of demographic data (age, gender, color, current religion, religious background, and parents' level of education).

The GHQ-12 (General Health Questionnaire) is a self-reported questionnaire containing 12 items, six of which are positively phrased questions and six negatively phrasing questions with answers on a four-level Likert scale. This instrument presents high reliability in most validation studies and is widely used in different areas and with different populations in order to identify common mental disorders (AUERBACH *et al.*, 2018). The questionnaire was translated into the Portuguese language and validated in Brazilian general population by

Gouveia *et al.* (2003). Given the variation of results among different populations, often with decompositions into two, three, or even more factors, other studies have been conducted to obtain the validation of the instrument for specific populations, such as teachers and physicians. However, validation has not yet been obtained in a population of Brazilian medical students, despite its wide use in national studies (CONCEIÇÃO *et al.*, 2019).

Procedures

The research was approved by the Research Ethics Committee and registered by number 51131015.2.0000.5237. Data collection took place in the classroom, in the beginning or end of classes, moments in which students received information about the research objectives in a way that would not impact the results, as required by Brazilian ethics regulations. In order to ensure the anonymity of participants, forms were deposited in sealed boxes that were only opened after the end of the data collection phase. Later, the information was inserted into an MS Office package database and converted into a Stata file. The answers to questions 03, 04, 05, 06, 08 and 09 were recoded because they had inverted answers in relation to the other questions.

Analysis

The structural construct validity of the questionnaire was evaluated by confirmatory factor analysis (PÉREZ *et al.*, 2020). Data were checked for asymmetry (*A*) and kurtosis (*K*) values in search of violations of the normal data distribution pattern. Reliability was evaluated by Cronbach's alpha coefficient and by the correlation between items, before and after the rectification of negative items. The data were submitted to Bartlett's sphericity test for intercorrelation and to the Kaiser-Meyer-Olkin Sample Adequacy Measure (KMO). Floor and ceiling effects, defined as a lowest or highest sum scores of 15% of respondents, were checked (ŠIMKOVIC; TRÄUBLE, 2019). The factorial correlation of the items was evaluated by orthogonal rotation (Varimax). Principal component analysis was performed by taking a higher *eigenvalue* considered relevant to the unit. The confirmatory analysis was obtained by means of the covariance matrix and a maximum likelihood estimation of the items. The adequacy of the models was estimated by means of the following adjustment indicators: chi-

square ratio in relation to the degrees of freedom (χ2/gl), Comparative-Fit Index (CFI), Mean Root Square Approximation (RMSEA) and Standardized Root Mean Square Residual (SRMR). The model was considered to have an acceptable or good adjustment, if: χ2/ df between 5 and 2; CFI greater than 0.9; RMSEA below 0.1; and SRMR below 0.08 (FÁVERO; BELFIORE, 2017; MAROCO, 2014).

RESULTS AND DISCUSSION

This study aimed to assess GHQ-12 validity for a Brazilian medical students population from 431 participants, a sample size that is considered adequate both in the light of reaching a point of stability (HOFER, 2020), as well as if we consider an ideal item-to-individual *ratio* of 1:10 (MAROCO, 2014) which would be surpassed by our data (431 individuals to 12 items, 1:35).

Age ranged from 18 to 41 years, with an average of 23 years (SD=3.75). Regarding gender and color, 66% (n=278) reported being female and 81.47% (n=343) were defined as white, respectively. Singles represented 95.73% (n=404) of the sample and, when asked about religion, 50.95% (n=215) of the students were defined, currently, as Catholics, followed by 19.19% (n=81) of Spiritists and 14.4% (n=61) who said they had no religion. Regarding the religious context in which they were educated, 81.04% (n=342) reported having been raised in Catholicism. Regarding their parents' level of education, the majority had completed higher education, which corresponded to 74.9% (n=317) of the mothers and 64.54% (n=273) of the fathers. When analyzing the presence of depressive symptoms in respondents, there is a prevalence of CMD 58.8% (n = 252). The lowest prevalence is concentrated in the first two years with a peak in the third year and a slight decrease until the last few years.

Studies conducted on medical students often reveal great homogeneity of the population, as observed in the data of the present investigation: young, white, Catholic adults in their early 20s coming from families with a high level of school education. Our data also corroborate findings that indicate the feminization of the medical class in the national territory (SCHEFFER *et al.*, 2018). Although such homogeneity does not compromise the

results found, it should be taken into account in the analysis of the data (LAROS, 2005). The reliability index (Cronbach's alpha) greater than 0.7 (α=0.88) characterizes the internal consistency of the questionnaire in the population of medical students and its conformity with the findings on other populations in previous studies (GOUVEIA *et al.*, 2010; HYSTAD; JOHNSEN, 2020).

The mean rate of the 12 GHQ items ranged from 1.88 (*Item 03: been able to keep an eye on the things you are doing?*) to 0.53 (*Item 12: considered yourself worthless?*). The values obtained from asymmetry and kurtosis for each item of the scales' questionnaire are lower than the unit in the total sum of all items, attesting to the normal distribution of values. The descriptive data and an abbreviation of the GHQ questions can be seen in Table 01. No floor or ceiling effect was found (minimum = 0.23% maximum = 0). GHQ reliability was evaluated by Cronbach's alpha, reaching a result of 0.84 without rectification of negative items and 0.77 after correction, both results considered satisfactory. The adequacy of the correlation matrix of the questionnaire by means of the sphericity test showed a lower than 0.001 *p* and the KMO measurement was 0.84, indicating the adequacy of the factorial analysis in the sample.

Table 1 - Descriptive GHQ-12 data in medical students, N = 431.

Question	**Mean**	**SD**	***A***	***K***
Lost must sleep	1,42	1	0,94	0
Under stress	1,72	0,91	0,17	0
Able to concentrate	1,88	0,55	0,92	0,23
Playing useful part	1,75	0,57	0,95	0,83
Face up to problems	1,6	0,65	0,24	0
Capable of making decisions	1,86	0,65	0,23	0
Could not overcome difficulties	1,33	0,84	0,07	0,01
Feeling reasonably happy	1,92	0,68	0,41	0
Enjoy normal activities	1,91	0,67	0,36	0
Feeling unhappy and depressed	0,96	0,94	0	0
Losing confidence	0,9	0,98	0	0
Thinking of self as worthless	0,53	0,87	0	0

Source: Authors.

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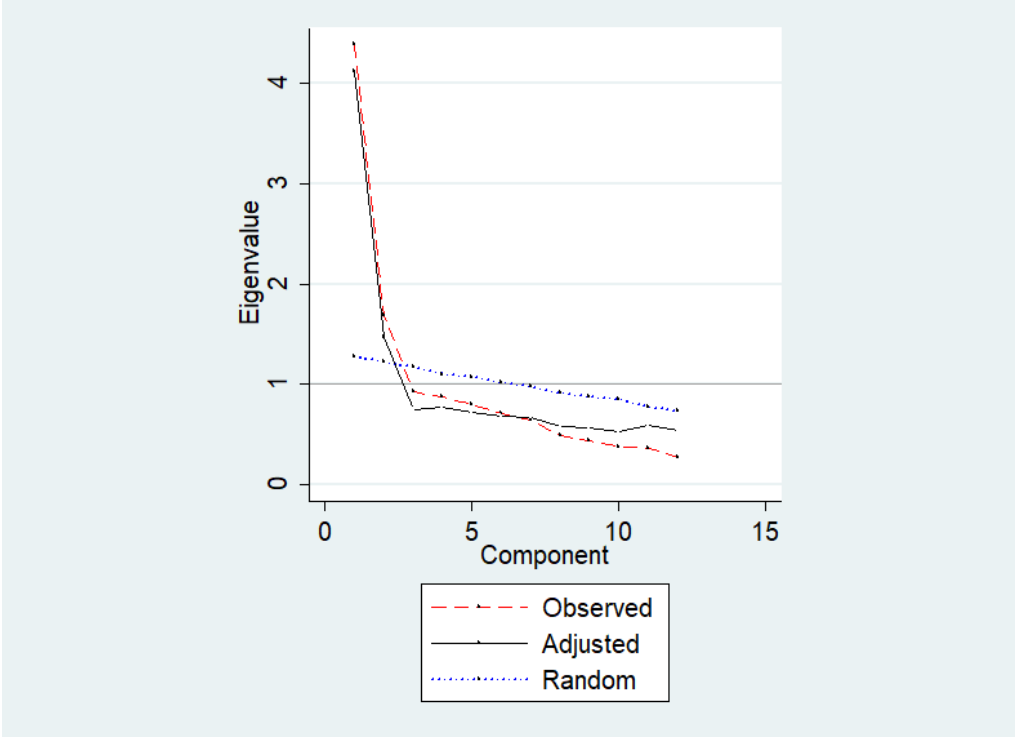
The principal component analysis allowed the identification of 2 factors, from an eigenvalue (Kaiser criterion) greater than 1. The same factors were identified by Varimax orthogonal rotation in the following configuration: Factor 1, composed by questions 01, 02, 07, 10, 11 and 12; and Factor 2, consisting of questions 03, 04, 05, 06, 08 and 09. This model

found similarity with many other propositions previously confirmed and analyzed by other studies (CONCEIÇÃO *et al.*, 2019; HYSTAD; JOHNSEN, 2020; PÉREZ *et al.*, 2020). The data were submitted to a Scree test and to Horn's parallel analysis, which supported assuming both a unifactorial and a bifactorial model (Figure 01). Additionally, a satisfactory theoretical connection between the items of each factor in the bifactorial model was achieved by nominating the first factor "Depression" as its composition included the questions "Lost must sleep"; "Under stress"; "Could not overcome difficulties"; "Feeling unhappy and depressed"; "Losing confidence" and "Thinking of self as worthless" and the second factor, composed by the questions "Able to concentrate"; "Playing useful part"; "Face up to problems"; "Capable of making decisions"; "Feeling reasonably happy" and "Enjoy normal activities" was named "Social dysfunction".

Figure 1. Scree test of the eigenvalues of principal components analysis and parallel analysis of GHQ.



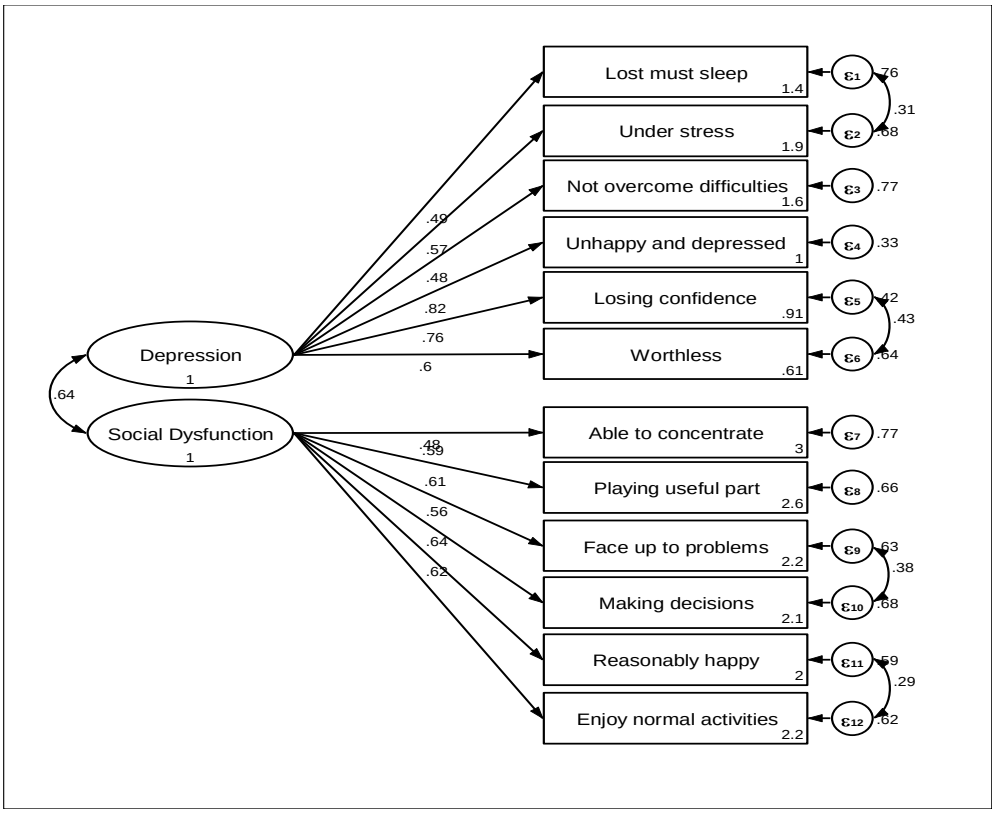
Source: Authors.

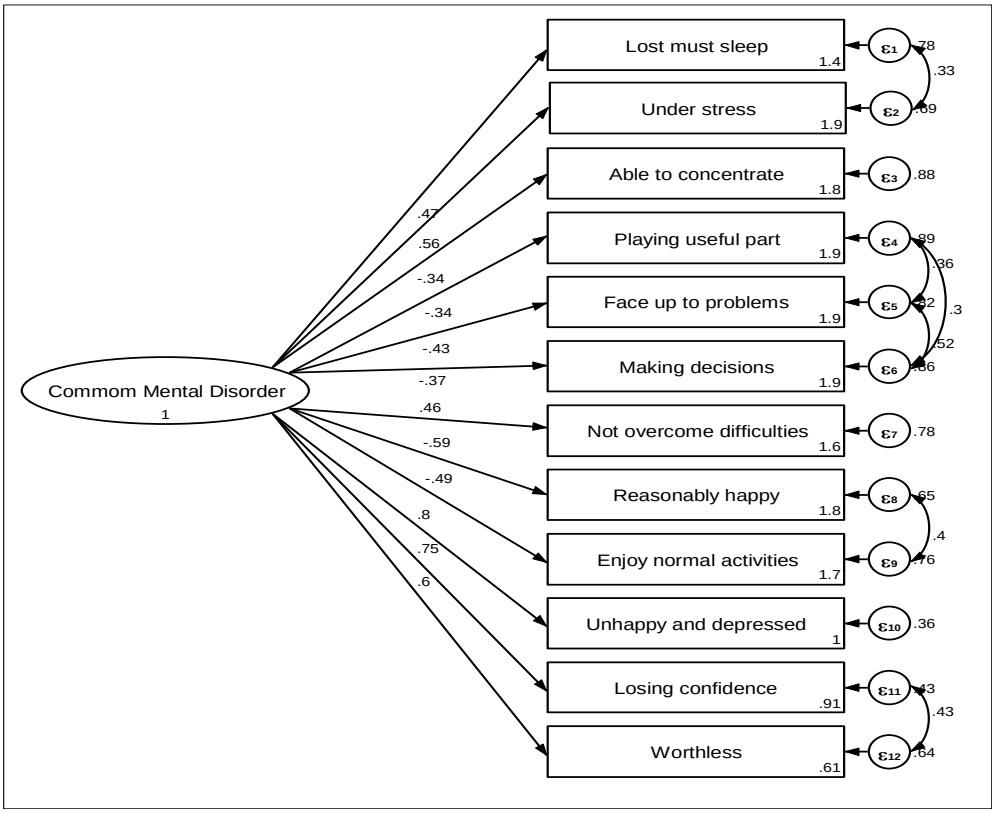
After the adoption of an initial unifactorial model as a starting point, the fit statistics showed a poor and unacceptable result. Based in the covariance of errors in the measurement of items that presented high rates of modification and whose conceptual correlations were

plausible, the errors of some of the items were correlated as shown in figure 2 resulting in a suitable model fit. As a bifactorial model was taken into consideration, the same path of adjustment was performed to enhance model fit statistics, always in the light of theoretical plausibility. The fit statistics for the two models are presented in table 02 and both models met the proposed criteria for goodness of fit (FÁVERO; BELFIORE, 2017; MAROCO, 2014).

As data on factor loads were considered, the analysis showed how loadings in the bifactorial model were much more robust than those in the unifactorial solution (Figure 2). Data on model goodness of fit also showed a good fit for both models, but the results on unifactorial model were less evident (CFI = 0.936; SRMR = 0.063; RMSEA = 0.07) than the output of the bifactorial model (CFI = 0.962; SRMR = 0.048 RMSEA = 0.054), favouring the later as a best representation of the data. Either case, psychometric validity of GHQ-12 in medical students is presumable and our findings on a bifactorial model confirm the findings based on *depression* and *social dysfunction* previously observed in different research (GOUVEIA *et al.*, 2003, 2010).

Figure 2. Unifactorial and bifactorial GHQ model in medical students





Source: Authors.

Table 2 - Fit statistics for the tested models of the 12-item GHQ-12, N = 431.

Models	X^2 *	*df*	X^2/df	CFI	SRMR	RMSEA	AIC
Unifactorial	154	48	3,21	0,936	0,063	0,07	11054,2
Bifactorial	111	*49*	2,27	0,962	0,048	0,054	11009,7

AIC, Akaike information criterion; CFI, comparative fit index; RMSEA, root mean error of approximation; SRMR, standardized root mean square residual; * $p < 0.001$

Source: Authors

CONCLUSION

The present study evaluated the validity of GHQ-12 in a population of medical students attending a private institution in the State of Rio de Janeiro, Brazil. The objective of the study involved the psychometric qualities of the instrument and its validation in this population, which was achieved by means of factor analysis in a model of structural equations. Our data pointed at a bifactorial model, which responded well to the instrument's analysis procedures. This choice was supported by a better goodness of fit found in this model, but also backed by a good articulation between our analysis, the theoretical model, and previous findings by other researchers.

Data analysis was conducive to the validation of the GHQ for the student population in its appropriately adjusted, unifactorial version, which makes it possible to use it in studies that intend to assess common mental disorders in this segment of the academic community.

One limitation to be considered on the present study resides is the fact that it deals with a single, private, institution, a factor that could represent a certain level of *bias.*

Considering the applicability of the instrument for research in the university population, it is also possible to indicate that new research initiatives include other courses, not only in the healthcare area, but also humanities and exact sciences, expanding and qualifying the debate on mental health in the academic environment.

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