The Open Psychology Journal
DOI: 10.2174/0118743501268244231108104216, 2024, 17, e18743501268244
ISSN: 1874-3501
1

RESEARCH ARTICLE OPEN ACCESS

Psychometric Properties and Factor Structure of the Hamilton Anxiety Rating Scale among Korean University Students during COVID-19

Hyelin Jeong[1] and Boram Lee[1,*]

[1]*Department of Early Childhood Education, Woosong University, Daejeon, South Korea*

Abstract:

Background: The Hamilton Anxiety Rating Scale (HAM-A) is a 14-item instrument that is extensively used in clinical and epidemiological studies to determine the presence of anxiety symptoms. Despite the widespread application of the HAM-A in research, it remains unclear whether the instrument's construct is best represented as uni- or multidimensional. This study aimed to assess the reliability and construct validity of the Korean version of the HAM-A through its factor structure.

Methods: Accordingly, a cross-sectional design was employed to conduct an online survey with 252 university students enrolled in an undergraduate degree program for 4 years in South Korea during the recent coronavirus (COVID-19) pandemic. Confirmatory factor analyses (CFAs) were employed to identify the two-factorial structure of the instrument, *i.e.*, psychic/psychological and somatic.

Results: The results revealed that the reliability and item characteristics were favorable. Confirmatory factor analyses identified a two-factorial structure of psychic/psychological and somatic with a moderate correlation between the two latent constructs, thus suggesting a single overarching construct of anxiety.

Conclusion: Our findings suggest that the Korean version of HAM-A was found to be a valid and reliable instrument that can be employed to screen Korean university students for anxiety.

Keywords: Anxiety, COVID-19, Factor analysis, The hamilton anxiety rating scale, Students, CFAs.

*Address correspondence to this author at the Department of Early Childhood Education, Woosong University, 171 Dongdaejeon-ro, Dong-gu, Deajeon 34606, South Korea; Tel: +82-42-630-9372; E-mail: blee@wsu.ac.kr

Cite as: Jeong H, Lee B. Psychometric Properties and Factor Structure of the Hamilton Anxiety Rating Scale among Korean University Students during COVID-19. Open Psychol J, 2024; 17: e18743501268244.
http://dx.doi.org/10.2174/0118743501268244231108104216

Received: July 19, 2023
Revised: September 13, 2023
Accepted: October 04, 2023
Published: February 01, 2024

1. INTRODUCTION

Anxiety disorders, which are characterized primarily by excessive fear and worry, are the most common set of psychiatric disorders and are known to have considerable individual and societal costs [1]. According to the DSM-5, anxiety disorders include generalized anxiety disorder, panic disorder, social anxiety disorder, separation anxiety disorder, selective mutism, and specific phobias [2]. If left untreated, anxiety disorders may become chronic and be associated with cognitive impairment, depression, disability, and poor quality of life [3]. In South Korea, the estimated lifetime prevalence of anxiety disorders was 9.3% and the annual prevalence rate in 2021 was 3.1%. While the highest prevalence occurred in those between 18 and 29 years of age, anxiety disorders were more common in females (4.7%) than in males (1.6%) [4].

Students can experience emotional and academic challenges when they enroll in university programs because they must adapt to a new learning environment, manage tuition fees, assume self-responsibility, develop a career, and attain independence [5]. Although the developmental period of emerging adulthood may be

regarded as a period of personal growth, it can also be marked by increased vulnerability and distress. In comparison to other adult age groups, self-reported mental health issues are most prevalent among young adults between the ages of 18 and 29 [6, 7]. Thus, emerging adulthood may present significant mental health risks. Adams *et al*. [6] found that mental health issues that affect university students include depression, anxiety, and substance abuse. Furthermore, it has become increasingly apparent that the outbreak of the pandemic has posed a threat to university students' mental health. Because of the mandatory physical distancing measures associated with the pandemic, many students have been confronted with additional challenges, including campus closures and online and distance learning, which have led to a sense of uncertainty related to academic success as well as increasing fear about the uncertainty of their overall learning [8].

The COVID-19 pandemic made anxiety among university students a growing global public concern. Some studies conducted in Korea have also examined the impact of the pandemic on the psychological states of university students. Jung *et al*. [9] revealed that 20% of a sample of 209 university students experienced severe stress, anxiety, and depression due to COVID-19. Chen *et al*. [10] found that Korean students decreased their daily activities, visited fewer places, suffered more worry, and reported low levels of happiness. The anxieties experienced by university students are characteristically related to academic failure, criticism, and physical appearance [11]. Therefore, they could differ from the types of anxiety sensed by other general populations including adolescents and older adults, or by vulnerable populations such as clinical patients. Thus, it is imperative to devise accurate screening tools for anxiety disorders to assess the anxieties experienced by university students. These screening instruments would facilitate early intervention in mental health settings on campuses. However, scant screening tools designed to detect the presence and severity of anxiety symptoms exist in Korea owing to the paucity of psychometric validation research [12].

The 14-item Hamilton Anxiety Rating Scale (HAM-A) was developed by Hamilton in 1959 to detect symptoms of anxiety in clinical populations [13]. HAM-A has since been translated into several languages in different cultures. Available studies have attested to the instrument's robust psychometric properties, including excellent reliability and construct validity in multicultural populations [14-16], psychiatric patients [17, 18] and adolescents [19]. Although the HAM-A is beneficial in determining anxiety in clinical and nonclinical samples, there is no clear consensus about the instrument's factor structure. While some studies have demonstrated that data favored an optimal two-factor structure [14, 16, 19], others have recommended an optimal three-factor structure [17, 18]. Somatic anxiety symptoms constitute a separate factor in two- and three-factor structures. However, anxiety and depressive symptoms have either represented a unitary factor in two-factor models or denoted as distinctive factors in three-factor models [18].

These differences, however, have partially been due to the use of specific subgroups of individuals that may limit generalizability. Given the controversial conclusions of international studies in relation to the dimensionality of the HAM-A, its factor structure warrants further examination. Moreover, despite the relatively high prevalence of anxiety disorders among university students, this instrument has not been employed among Korean university students. Furthermore, no study to date has examined the factor structure among Korean populations. Accordingly, the purpose of this study was to provide a comprehensive validation of the HAM-A for Koreans. Specifically, the objectives of the study were: (1) to explore the factor structure of the Korean version of HAM-A by employing confirmatory factor analysis (CFA) and (2) to examine the reliability of the Korean version of the HAM-A among Korean university students.

2. METHODS

2.1. Participants

Convenience sampling was employed to recruit 252 university students (80 male and 172 female) from a four-year university in a central region of Korea. Specifically, the participants were recruited from the Department of Culinary Arts, Child Education, Social Work, and Public Health. The mean age of the sample was 20.6 (SD = 4.68) and that of the male and female participants was 20.2 (SD = 2.31) and 20.8 (SD = 5.44), respectively.

2.2. Procedures

After obtaining research ethical approval ((Protocol Code: 1041549-230117-SB-155), an online cross-sectional survey was conducted during the COVID-19 pandemic between December 26, 2022 and May 1, 2023. Google platform was employed to conduct the survey. An anonymous survey invitation and its link were sent *via* email to instructors in the university's different faculties who subsequently forwarded it to their students. The purpose of the study as well as its voluntary and confidential nature were explained in the email. Before completing the survey, the participants were required to provide consent online. The survey was accessible for a four-week period and thereafter automatically disabled. However, two reminders were emailed to potential participants during this time.

2.3. Instrument

The HAM-A is a 14-item instrument developed to measure the severity of anxiety. Each item is evaluated on a five-point Likert-type scale, ranging from 0 (*symptoms not* present) to 4 (*very severe symptoms*). The total HAMA score ranges from 0 to 56 points, with scores above 30 indicating severe anxiety symptoms. While a score between 0 and 14 is indicative of mild anxiety, a score between 18 and 24 suggests moderate anxiety and one greater than 24 severe anxiety. Half of the items (items 1 to 6 and 14) address psychic/psychological anxiety, that is, mental agitation and psychological distress whereas the

remaining seven items (items 7 to 13) measure somatic anxiety, namely, physical complaints related to anxiety. The Korean version of HAM-A, as translated and validated by Kim [20], was employed in this study

2.4. Statistical Analyses

IBM SPSS Statistics (Version 23.0) was employed to perform all the statistical analyses. The CFA was conducted in IBM AMOS 20. Prior to the analyses, the data for the 14 items of the HAM-A were examined for any deviations from missing values and normality. The items' missing values were replaced by employing expectation maximization. The number of missing value was less than 1% of the total number of cases. The overall response rate was 97% (252 of 260). Cronbach's alpha (α) was used to evaluate the internal consistency reliability.

Subsequently, covariance matrices and the maximum likelihood estimation method were employed to conduct CFA. The CFA examined three models: (1) a unidimensional model, with all 14 anxiety items loaded as the single latent variable (2), the original two-factor model developed by Hamilton [13], with seven psychic anxiety items loaded on one factor and seven somatic anxiety items loaded on another and (3) a correlated three-factor model proposed by Leentjens *et al*. [17], with separate anxiety, depression, and somatic symptoms as the latent variables. The models were deemed acceptable if they met the following goodness-of-fit criteria: the chi-square test divided by degrees of freedom (χ^2/DF) < 5 [21]; a comparative fit index (CFI) of ≥ .90; a goodness-of-fit index (GFI) of ≥ .90; a root mean square error of approximation (RMSEA) of ≤ .060 and its 90% confidence interval (90% CI); a standardized root mean square residual (SRMR) of ≤ .080 [21, 22]; and Akaike's information criterion (AIC). Plausible models were compared, with lower values indicating a better model fit.

Although no clear consensus has been reached regarding the acceptable sample size for factor analysis. One suggested guideline is to use the ratio of 10:1 (sample to variable ratio) [23], while other studies have indicated that *n* >200 is an adequate sample size for CFA [24]. Our sample was large enough for the intended analysis since the *n* of 252 for 14 items meets both the *n* > 200 and 10:1 requirements.

3. RESULTS

3.1. Descriptive Statistics

The mean scores and standard deviations for the individual HAM-A item scores are displayed in Tables **1** and **2**. The participants' mean total score was 9.25 (SD = 8.68), suggesting that overall they suffered mild symptoms of anxiety. While the highest average score was achieved for the psychic/ psychological anxiety scale, the lowest average score was obtained for the somatic anxiety scale.

3.2. Confirmatory Factor Analysis

The CFA results of the three models are summarized in Table **3**. CFA was performed with the one-, two-, and three-factor models to examine the theoretical foundation of the HAM-A. Of the three theoretical models, the one-factor model had the poorest fit, with values for CFI, GFI, RMSEA, and SRMR that were outside the recommended cut-offs (χ2 = 385.2, df = 77; χ2 /df = 5.0; CFI = 0.81; GFI = 0.85; RMSEA = 0.126 (90% CI =.114–.139); SRMR = 0.804). The original two-factor model recommended by Hamilton better fit the data as the chi-square value; further, the CFI, GFI, RMSEA, and SRMR statistics significantly improved and all statistical values were incorporated within the good fit range (χ2 = 168.3, df = 74; χ2 /df = 2.3; CFI = 0.94; GFI = 0.97; RMSEA = 0.056 (90% CI = 0.049– 0.072); SRMR = 0.050). The two factors were moderately correlated (0.52). Finally, the three-factor model did not fit the data as well as both the two factor models (χ2 = 242.7, df = 76; χ2 /df = 3.2; CFI = 0.89; GFI = 0.92; RMSEA = 0.091 (90% CI = 0.098–0.109); SRMR = 0.074). Thus, the original two-factor model was the best-fitting model. In this model, factor loadings for the HAM-A items ranged from 0.44 to 0.79. The AIC of 230.3, which was lower than the other models tested in the study, further confirmed the superior fit of Hamilton's two-factor model. Overall, the two-factor model provided the best fit for the data obtained in our study.

Table 1. Descriptive statistics for HAM-A items.

Item	*M*	*SD*
1. Anxious mood	1.22	1.08
2. Tension	1.34	1.19
1. Fears	.76	.97
2. Insomnia	.93	1.17
3. Intellectual	.80	1.05
4. Depressed mood	.88	1.07
5. Somatic (Muscular)	.55	.91
6. Somatic (Sensory)	.52	.90
7. Cardiovascular symptoms	.23	.60
8. Respiratory symptoms	.13	.48
9. Gastrointestinal symptoms	.62	.64
10. Genitourinary symptoms	.25	.66
11. Autonomic symptoms	.50	.90

(Table 1) contd.....

Item	*M*	*SD*
12. Behavior at interview	.51	.88
Total score	9.25	8.68

Table 2. Goodness-of-fit indices of models for the HAM-A.

Model	k	χ^2	df	χ^2/df	CFI	GFI	RMSEA (90% CI)	SRMR	AIC
Model 1	14	385.2	77	5.0	.81	.85	.126 (.117-.139)	.080	441.2
Model 2	14	168.3	74	2.3	.94	.97	.056 (.049-.072)	.050	230.3
Model 3	14	242.7	76	3.2	.89	.92	.091 (.081-.109)	.074	300.7

Note: *k*=number of items; *df*=degrees of freedom; CFI=comparative fit index; GFI=goodness of fit index; RMSEA=root mean square error of approximation; SRMR=standardized root mean residual; AIC=Akaike Information Criterion.
*p < .01.
Model 1 is a one-factor model.
Model 2 is based on Hamilton's two-factor model.
Model 3 is based on Rodriguez-Seijas et al.'s three-factor model.

Table 3. Standardized factor loadings for CFA models.

-	Factor 1	Factor 2
1. Anxious mood	.67	-
2. Tension	.49	-
3. Fears	.52	-
4. Insomnia	.60	-
5. Intellectual	.79	-
6. Depressed mood	.71	-
7. Somatic (Muscular)	-	.52
8. Somatic (Sensory)	-	.73
9. Cardiovascular symptoms	-	.44
10. Respiratory symptoms	-	.46
11. Gastrointestinal symptoms	-	.52
12. Genitourinary symptoms	-	.57
13. Autonomic symptoms	-	.69
14. Behavior at interview .58	.58	-

Notes: A cutoff value for item factor loading is ≥.40.
Factor 1 = Psychic/ Psychological items; Factor 2 = somatic items.

3.3. Reliability and Item Analysis

Cronbach's alpha coefficients were employed to assess reliability. Item properties were assessed in accordance with corrected-item-total correlations and coefficients and variations in Cronbach's alpha coefficients if items had been deleted. Cronbach's alpha (α) of all 14 items of the HAM-A and two factors were .90, .88, and .82, respectively. Correcteditem–total correlations for individual HAM-A items ranged from 0.44 to 0.72. The obtained Cronbach's alpha coefficients if the item was deleted were found to be high (>0.80), and the alpha did not substantially change by more than 0.05 with the exclusion of any item.

4. DISCUSSION

This study examined the construct validity of the HAM-A 14 by exploring the instrument's factor structure with a sample of Korean university students. The HAM-A exhibited satisfactory internal consistency and construct validity, thus revealing its utility for measuring anxiety in this population. This is the first study in which factor analytic findings for the HAM-A have been provided in a nonclinical sample in Korea. The Korean university students who completed the survey belonged to the frequently studied group who suffer myriad stressors, including university transition, academic demands independence/autonomy, intimate relationships, and responsibility that can lead to anxiety [25]. It is imperative that more effort needs to be expended to detect anxiety and implement treatment among university students timeously because they are particularly at risk for psychiatric disorders in comparison to other adult age groups [6, 7].

The study results on the scale's dimensionality suggest a two-factor structure for the HAM-A as evidenced by CFA. These findings concur with previous findings that the HAM-A is best understood as a multidimensional factor structure [14, 16-19], representing the psychic/ psychological and somatic dimensions of anxiety (*i.e.*, the two-factor model). Moreover, the results of exploring the

HAM-A factor structure were similar to those of studies that have included general adult populations [18, 20]. Although this study's findings challenge Leentjens *et al*.'s assertion that a unidimensional or one-factor model was a better fit than two- or three-factor models, these contradictory findings may be attributed to the fact that the student sample in this study may have differed significantly from clinical samples of Parkinson's disease in Leentjens *et al*. [17].

Classifying anxiety into the two separate factors of the psychic/psychological and somatic moderately correlated constructs may provide a useful model to investigate the impact of interventions for anxiety such as psychopharmacological treatment [16]. Although the medication could have an effect on the psychological dimension of anxiety, it may not affect the cognitive dimension of anxiety. An exploration of how different therapeutic dimensions of anxiety may facilitate a comprehensive understanding of effective treatment, identify predictors of relapse, enhance the identification of individuals at increased risk, and inform new approaches to prevent it or discontinue treatment [16].

Regarding estimates of internal consistency for the HAM-A, the scale scores were in the good to excellent range. In particular, the high estimates of internal consistency reliability for the two scales and total scores in both community and clinical samples have ranged between good and excellent and concur with those reported for the HAM-A [14-18]. These findings suggest that the HAM-A exhibits good internal consistency across different populations and languages. Simultaneously, with the exception of Cronbach's alpha of individual items, the coefficient values were lower than the total coefficient value. This indicates that removing any item may decrease the overall credibility value of the scale. Thus, one may deduce that each item of the HAM-A scale is essential and of equal importance to assess the symptoms of anxiety in Korean university students.

Although the prevalence of anxiety was relatively higher in this study than that reported in nonclinical samples [26, 27], it was lower than that of a clinical sample of patients [28, 29]. Because our online survey was conducted during the COVID-19 pandemic in Korea when the campus was closed and social distancing restrictions were still in place, this is expected. The stresses and restrictions associated with the pandemic may have caused many students to suffer heightened levels of anxiety. However, these findings should be cautiously interpreted with due consideration to the prevalence of COVID-19 in Korea when the data for the study were collected.

This study has several limitations. First, as our sample consisted of undergraduate students, it is not clear whether the pattern of findings and the factorial structure can be generalized across populations of different ages and backgrounds. Also, it is uncertain whether our findings can be generalizable over time even after the pandemic. Although our study supported the two-factor model of the HAM-A as a valid and reliable measure for young adults, the competing two-factor models may be more feasible for other populations. Nevertheless, future research must replicate the study across diverse samples. Second, a cross-sectional design was employed in this study and thus, a causal relationship could not be determined. Prospective follow-up studies may help to address the issues of causality. Third, because the data had to be collected by means of an online survey due to COVID-19, those without internet access may have been unable to participate [8]. However, as the target population was university students, this limitation possibly only influenced the results slightly.

CONCLUSION

The factor structure of the Korean version of the HAM-A was explored so as to provide more empirical data for the development of the HAM-A and the advancement of mental health measurement. The findings support Hamilton's original theoretical model that revealed two distinct categories of psychic/psychological and somatic symptoms. The items of the Korean version of HAM-A were also found to have high internal consistency and be psychometrically sound. The availability of the Korean version of the HAM-A for clinical and campus outreach screening can enhance the identification of students who need assistance.

ABBREVIATIONS

CFAs	=	Confirmatory factor analyses
HAM-A	=	Hamilton Anxiety Rating Scale

ETHICS APPROVAL AND CONSENT TO PARTICIPATE

The research ethical was approved by Woosong University, South Korea (Protocol Code: 1041549-230117-SB-155).

HUMAN AND ANIMAL RIGHTS

No animals were used that are the basis of this study. All procedures performed in studies involving human participants were in accordance with the ethical standards of institutional and/or research committees and with the 1975 Declaration of Helsinki, as revised in 2013.

CONSENT FOR PUBLICATION

Informed consent was obtained from all participants of this study.

STANDARDS OF REPORTING

STROBE guidelines were followed.

AVAILABILITY OF DATA AND MATERIALS

The research data supporti ng the fi ndings of this study will be available upon request from corresponding author [B.L].

FUNDING

The research was funded by Woosong University (Grant number: 2023031-1922-15-WB).

CONFLICT OF INTEREST

The authors declare no conflict of interest financial or otherwise.

ACKNOWLEDGEMENTS

Declared none.

REFERENCES

[1] Bandelow B, Michaelis S. Epidemiology of anxiety disorders in the 21st century. Dialogues Clin Neurosci 2015; 17(3): 327-35. http://dx.doi.org/10.31887/DCNS.2015.17.3/bbandelow PMID: 26487813

[2] American Psychiatric Association (APA). Diagnostic and statistical manual of mental disorders (DSM-5). Washington, DC: American Psychiatric Publishing Inc 2013.

[3] Maron E, Nutt D. Biological markers of generalized anxiety disorder. Dialogues Clin Neurosci 2017; 19(2): 147-58. http://dx.doi.org/10.31887/DCNS.2017.19.2/dnutt PMID: 28867939

[4] Kim HS, Kim MK, Kim YS, Han GW. The Survey of Mental Disorders in Korea. Sejong, Korea: Ministry of Health & Welfare 2021.

[5] Bessaha ML. Factor structure of the Kessler Psychological Distress Scale (K6) among emerging adults. Res Soc Work Pract 2017; 27(5): 616-24. http://dx.doi.org/10.1177/1049731515594425

[6] Adams SH, Knopf DK, Park MJ. Prevalence and treatment of mental health and substance use problems in the early emerging adult years in the United States findings from the 2010 National Survey on Drug Use and Health. Emerg Adulthood 2014; 2(3): 163-72. http://dx.doi.org/10.1177/2167696813513563

[7] Arnett JJ. Emerging adulthood: The winding road from the late teens through the Twenties. (2nd ed..), New York, NY: Oxford University Press 2014. http://dx.doi.org/10.1093/acprof:oso/9780199929382.001.0001

[8] Zurlo MC, Cattaneo Della Volta MF, Vallone F. COVID-19 student stress questionnaire: Development and validation of a questionnaire to evaluate students' stressors related to the coronavirus pandemic lockdown. Front Psychol 2020; 11: 576758. http://dx.doi.org/10.3389/fpsyg.2020.576758 PMID: 33192888

[9] Jung NH, Park H, Jo H. Korean college students' psychological distress surrounding COVID-19. Asia Taepyongyang Sangdam Yongu 2021; 11(2): 41-55. http://dx.doi.org/10.18401/2021.11.2.3

[10] Chen WL, Song SY, Yap KH. The unintended consequences of the pandemic: The new normal for college students in South Korea and Taiwan. Front Public Health 2021; 9: 598302. http://dx.doi.org/10.3389/fpubh.2021.598302 PMID: 34046381

[11] Stallard P. Anxiety: Cognitive behaviour therapy with children and young people. London: Routledge 2009.

[12] Kim Y, Park Y, Cho G, *et al*. Screening tool for anxiety disorders: Development and validation of the Korean Anxiety Screening Assessment. Psychiatry Investig 2018; 15(11): 1053-63. http://dx.doi.org/10.30773/pi.2018.09.27.2 PMID: 30481992

[13] Hamilton M. The assessment of anxiety states by rating. Br J Med Psychol 1959; 32(1): 50-5. http://dx.doi.org/10.1111/j.2044-8341.1959.tb00467.x PMID: 13638508

[14] Hallit S, Haddad C, Hallit R, *et al*. alidation of the Hamilton Anxiety Rating Scale and State Trait Anxiety Inventory A and B in Arabic among the Lebanese population. Clin Epidemiol Glob Health 2020; 4: 1104-9. http://dx.doi.org/10.1016/j.cegh.2020.03.028

[15] Ramdan IM. Reliability and validity test of the Indonesian version of the Hamilton Anxiety Rating Scale (HAM-A) to measure work-related stress in nursing. J Ners 2019; 14(1): 33-40. http://dx.doi.org/10.20473/jn.v14i1.10673

[16] Slater P, Bunting B, Hasson F, *et al*. An examination of factor structure of the hamilton anxiety rating scale in a non-clinical persian sample. Int J Res Nurs 2019; 10(1): 1-9. http://dx.doi.org/10.3844/ijrnsp.2019.1.9

[17] Leentjens AFG, Dujardin K, Marsh L, Richard IH, Starkstein SE, Martinez-Martin P. Anxiety rating scales in Parkinson's disease: A validation study of the Hamilton anxiety rating scale, the Beck anxiety inventory, and the hospital anxiety and depression scale. Mov Disord 2011; 26(3): 407-15. http://dx.doi.org/10.1002/mds.23184 PMID: 21384425

[18] Rodriguez-Seijas C, Thompson JS, Diehl JM, Zimmerman M. A comparison of the dimensionality of the hamilton rating scale for anxiety and the DSM-5 anxious-distress specifier interview. Psychiatry Res 2020; 284: 112788. http://dx.doi.org/10.1016/j.psychres.2020.112788 PMID: 31978629

[19] Clark DB, Donovan J. Reliability and validity of the hamilton anxiety rating scale in an adolescent sample. J Am Acad Child Adolesc Psychiatry 1994; 33(3): 354-60. http://dx.doi.org/10.1097/00004583-199403000-00009 PMID: 8169180

[20] Kim CY. Psychiatric assessment instruments. Seoul: Hana Medical Books 2000.

[21] Marsh HW, Hau KT, Wen Z. In search of golden rules: Comment on hypothesis testing approaches to setting cutoff values for fit indexes and dangers in overgeneralizing Hu & Bentler's (1999) findings. Struct Equ Model A Multidiscip J 1999; 11(3): 320-41. http://dx.doi.org/10.1207/s15328007sem1103_2

[22] Fan X, Sivo SA. Sensitivity of fit indices to model misspecification and model types. Multivariate Behav Res 2007; 42(3): 509-29. http://dx.doi.org/10.1080/00273170701382864

[23] Kline RB. Principles and practice of structural equation modeling. New York, NY: Guilford 2011.

[24] Comrey AL, Lee HB. A first course in factor analysis. (2nd ed..), Hillsdale, NJ: Lawrence Erlbaum 1992.

[25] Choi JH, Ju S, Kim KS, Kim M, Kim HJ, Yu M. A study on Korean university students' depression and anxiety. Indian J Sci Technol 2015; 8(S8): 1-9. http://dx.doi.org/10.17485/ijst/2015/v8iS8/64705

[26] Scimeca G, Bruno A, Cava L, Pandolfo G, Muscatello MRA, Zoccali R. The relationship between alexithymia, anxiety, depression, and internet addiction severity in a sample of Italian high school students. ScientificWorldJournal 2014; 2014: 1-8. http://dx.doi.org/10.1155/2014/504376 PMID: 25401143

[27] Lee J, Shin C, Ko YH, *et al*. The reliability and validity studies of the korean version of the perceived stress scale. Korean J Psychosom Med 2012; 20(2): 127-23.

[28] Mushtaq R, Shoib S, Shah T, Mushtaq S. Tryptophan hydroxylase 2 gene polymorphism in anxiety and depressive disorder in kashmiri population. J Clin Diagn Res 2014; 8(6): WC01-3. http://dx.doi.org/10.7860/JCDR/2014/9293.4453 PMID: 25121048

[29] Paul I, Ray S, Ray R, Singh N. Dissociative experiences and health anxiety in panic disorder. Indian J Psychiatry 2021; 63(1): 70-3. http://dx.doi.org/10.4103/psychiatry.IndianJPsychiatry_896_20 PMID: 34083823