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Validation and Reliability of the Revised Manipal Inventory of Academic Stress (MIAS) among Higher Secondary Students in Karnataka, India

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ABSTRACT

The Manipal Inventory of Academic Stress (MIAS) is designed to assess academic stress among higher secondary students in Karnataka, India. This study aims to validate an updated version of the MIAS, refined to an 18-item scale from its original 19-item format. A cross-sectional survey was conducted among 533 students (189 males and 344 females) from commerce and science streams. Exploratory and confirmatory factor analyses supported a unidimensional model of the MIAS, explaining 40.3% of the variance. The MIAS demonstrated high internal consistency (Cronbach's alpha = 0.923) and significant positive correlations with the Perceived Stress Scale (r= 0.789, p<0.001) and the stress subscale of the Depression Anxiety Stress Scales-21(r=0.707, p<0.001), along with a negative correlation with the Rosenberg Self-Esteem Scale (r=-0.751), indicating good concurrent and convergent validity. These findings underscore the MIAS's efficacy as a screening tool for academic stress in the Indian educational context. Its application can facilitate timely interventions, such as counseling or stress management programs, potentially mitigating adverse mental health outcomes in this demographic.

Keywords: Academic stress, Depression Anxiety Stress Scales-21 (DASS-21), higher secondary students, India, Manipal Inventory of Academic Stress (MIAS), Perceived Stress Scale (PSS), Rosenberg Self-Esteem Scale (RSES), validation study

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INTRODUCTION

Academic stress is a pervasive issue affecting adolescents worldwide, with significant implications for their mental well-being and academic performance. As the academic landscape becomes increasingly competitive, students grapple with stress from concerns over academic achievements, fear of failure, and high expectations (Lazarus & Folkman, 1984; Verma & Gupta, 1990). This form of stress is exacerbated by various environmental factors, including pressures from home, school, and peer relationships (Anderson et al., 2005). Academic stress has emerged as a critical public health and educational concern in India, particularly given the societal emphasis on academic success and its associated mental health repercussions (Deb et al., 2014; Pascoe et al., 2020).

Research indicates that academic stress can lead to adverse psychological and physical outcomes, including anxiety, depression, sleep disturbances, and reduced academic achievement (Estrada-Araoz et al., 2024; Pascoe et al., 2020). Female students, in particular, are more vulnerable to academic stress and its negative impacts compared to male students (Chyu & Chen, 2022; Jiang et al., 2021). Factors such as family expectations, peer pressure, and personal traits like perfectionism and self-efficacy significantly contribute to the stress experienced by adolescents (Hosseinkhani et al., 2019; Lisnyj et al., 2023). Studies have shown that approximately one in six students experience excessive distress, influenced by gender, anxiety proneness, lifestyle, and social connectedness (Lisnyj et al., 2023; Wuthrich et al., 2020).

In India, the prevalence of academic stress among higher secondary students is alarmingly high, with studies reporting significant stress levels in this demographic (Deb et al., 2014; Rentala et al., 2019; Roy et al., 2017; Subramani & Venkatachalam, 2019). For instance, research conducted in Kolkata found that 63.5% of higher secondary students faced academic stress (Deb et al., 2015). The National Crime Records Bureau (2021) highlighted that those students accounted for 8% of total suicides in India, with academic failure contributing to this statistic. India's large adolescent population further emphasizes the urgency of addressing academic stress and the stigmas surrounding mental health (United Nations International Children's Emergency Fund, 2019; World Health Organization, 2020).

Existing instruments for measuring academic stress in India, such as the Perceived Stress Scale (PSS) and the Academic Expectations Stress Inventory (AESI), offer valuable insights but have limitations. The PSS measures general rather than specific academic stress and lacks contextual relevance for Indian students (Ang & Huan, 2006; S. Cohen et al., 1983). While the AESI focuses on academic stress and has good validity and reliability, it may not encompass all relevant stressors specific to the Indian context and could carry cultural biases (Ang & Huan, 2006). The Manipal Inventory of Academic Stress (MIAS) was developed to address

these gaps, providing a contextually relevant tool tailored to the academic and cultural environment of Indian higher secondary students. The importance of culturally relevant stress assessment instruments is underscored by various studies that highlight the need for context-specific tools (Nooripour et al., 2024).

The MIAS comprehensively evaluates various sources of academic stress, including expectations from teachers, parents, and peers, academic workload, exam complexity, and societal pressures. Its contextual relevance, combined with high reliability and validity, makes the MIAS a potent tool for early detection of academic stress, facilitating timely interventions such as counseling or stress management programs (Mayya, Martis, et al., 2022; Mayya, Mayya, et al., 2022). By addressing these stressors, the MIAS enables educators and mental health professionals to implement targeted interventions and support, thereby significantly contributing to the well-being of students.

The present study aims to validate the revised MIAS, specifically developed to assess the stressors encountered by higher secondary students in Karnataka, India. The study objectives include validating the updated MIAS, assessing its effectiveness in capturing unique stressors, and evaluating its concurrent and convergent validity with established measures such as the PSS, Rosenberg Self-Esteem Scale (RSES), and Depression Anxiety Stress Scales-21 (DASS-21).

METHODOLOGY

Study Design, Participants and Setting

The present study used a cross-sectional survey among Higher-Secondary (Grade 11 and 12) students enrolled in the science and commerce stream in the Udupi District of Karnataka, India, from February to April 2021.

Sampling Technique and Sample Size

Three private and three public schools were selected randomly from the Udupi District to collect data from all consenting students in the science and commerce streams.

A sample size of 500 is considered 'very good' (Rules of Thumb guideline) for factor analysis (Van Voorhis & Morgan, 2007). The total number of respondents for MIAS was 533, which is (well above 500) adequate for Exploratory Factor Analysis and Confirmatory Factor Analysis (Table 2). To test the concurrent and convergent validity of MIAS, we correlated the score with other measures (PSS, DASS-21, RSES). Anticipating a minimum correlation of 0.3 between MIAS and other scales and subscale scores, the study would require a minimum sample size of 143 to estimate the expected correlation with a precision of 0.15 and 95% confidence (Moinester & Gottfried, 2014). For all the measures, a minimum of 154 subjects responded to the present study (Table 3).

Instruments

Demographic Variables

Socio-demographic variables: This study collected the participants' age, gender,

grade, and stream of education, in addition to other measures.

Manipal Inventory of Academic Stress

The MIAS initially contained 19 items. These items were selected from an original pool of 35, compiled through a literature review and discussions with Grade 11 and 12 students and teachers. The 35 items were then validated by twelve experts, including faculty from Psychiatry (1), Psychology (2), Medical Social Work (2), Statistics (2), English (1), Commerce (2), and Science (2). Faculty from Psychiatry, Psychology, and Medical Social Work were from an institute of medical science, while the remaining teachers had teaching experience in Grades 11 and 12.

The experts rated the relevance of each item for an academic stress scale on a 4-point scale: Not Relevant, Somewhat Relevant, Relevant, and Very Relevant. The Relevant and Very Relevant ratings were combined to calculate the percentage of items deemed relevant. Nineteen items that were rated as relevant by at least 80% of the experts were retained, following guidelines from the literature (Ayre & Scally, 2013).

The reliability and Confirmatory Factor Analysis suggesting one-dimensionality of the tool (19 items) is reported elsewhere. The first field study findings indicated no significant association of academic stress score with the medium of instruction and source of financial support for education (Mayya, Martis, et al., 2022). In the revised version of MIAS, two stressors, 'Lack of fluency in English' and 'Financial difficulties' were dropped from the initial 19-item scale. Experts felt that language and financial difficulty may be assessed, including them with demographic variables. A new stressor, 'Unable to discuss academics with parents,' was added after the approval of experts who validated the initial 19-item scale, as participants indicated it as one of the stressors in the second field study (Mayya, Mayya et al., 2022). With this, the MIAS in the present study includes 18 items on a five-point Likert-type rating scale (Copyrighted: L-118839/2022 dated 21/11/22). The tool may be used with response choices 0 to 4 or 1 to 5. In the present study, the response choices given were no stress (1), slight stress (2), moderate stress (3), high stress (4), and extreme stress (5). Previous studies with 19 items reported the internal consistency for a pilot study at 0.87 and the main study at 0.91(Mayya, Martis et al., 2022) and 0.90 (Mayya, Mayya et al., 2022), respectively.

Rosenberg Self-Esteem Scale (RSES)

The Rosenberg Self-Esteem Scale is a widely used psychological tool to assess a person's self-esteem or self-worth (Rosenberg, 1989). It consists of ten statements, with the respondent indicating the extent to which they agree or disagree with each statement on a four-point scale. The statements are designed to measure both positive and negative feelings about oneself. In the current study, the five positive statements are scored, giving "Strongly Agree" 4 points, "Agree" 3 points, "Disagree" 2 points, and "Strongly Disagree" 1 point

and the five negative statements are reverse scored. The scores are then summed up to produce a total score, with the possible range of scores being 10 to 40. Higher scores indicate higher self-esteem. Morris Rosenberg, the author of the Rosenberg Self-Esteem Scale, reported an internal consistency coefficient (Cronbach's alpha) of 0.92 for the original version of the scale (Rosenberg, 1965). Several subsequent studies have replicated the high internal consistency of the scale. For instance, a study of Psychometric Properties of the Rosenberg Self-Esteem Scale in the U.S. population across 30 demographic groups found an average Cronbach's alpha of 0.90 (range 0.84 to 0.95, and 0.91 for the overall sample), indicating a high level of internal consistency across demographic groups (Sinclair et al., 2010).

The Perceived Stress Scale (PSS)

The Perceived Stress Scale is a self-report questionnaire used to measure an individual's perceived stress level over the past month (S. Cohen et al., 1983; S. Cohen & Williamson, 1988). The scale was developed in 1983 and has since been widely used in research and clinical settings. The PSS consists of 10 items asking respondents to rate their feelings and thoughts about stressful events on a five-point Likert scale (ranging from 0 to 4 or 1 to 5). The questions assess the degree to which respondents feel that their lives are unpredictable, uncontrollable, and overloaded. The responses to the ten items are summed up to score the PSS, with some items being reverse-scored. The current study coded the response categories as 1 to 5. The total score ranges from 10 to 50, with higher scores indicating higher levels of perceived stress. A review of 12 studies examining the psychometric properties of the PSS-10 reported Cronbach's alpha varying between 0.74 and 0.91, indicating good internal consistency (E. H. Lee, 2012).

The Depression Anxiety and Stress Scales-21 (DASS-21)

DASS-21 is a widely used self-report questionnaire designed to measure symptoms of depression, anxiety, and stress (Lovibond & Lovibond, 1995). It consists of 21 items, with seven assessing each of the three constructs. The items are scored on a four-point Likert scale (0-3 or 1 to 4), with higher scores indicating more severe symptoms. In score DASS-21, each item is summed to create a total score for each of the three subscales (depression, anxiety, and stress). The current study coded the response categories as 1 to 4. The total scores can range from 7 to 28 for each subscale. The higher the score, the greater the severity of symptoms. DASS-21 was developed by Lovibond and Lovibond (1995) and has demonstrated good reliability and validity in various populations, including clinical and non-clinical samples (Antony et al., 1998; Brown et al., 1997; Henry & Crawford, 2005). Internal Consistency Reliability (Cronbach's Coefficient) for the DASS-21 across five different studies was 0.88 to 0.94 for depression, 0.80 to 0.87 for anxiety and 0.84 to 0.91 for stress (Sinclair et al., 2012). Another systematic review

examining the psychometric properties of the DASS-21 found an overall Cronbach's alpha of 0.90–.95 (6 studies), 0.82–0.94 for depression, 0.66 to 0.88 for anxiety, and 0.76 to 0.91 for stress, indicating excellent internal consistency (J. Lee et al., 2019).

Ethical Consideration

The study obtained approval from the Institutional Ethics Committee (IEC 414/2019, dated 14th November 2019). A document providing information for parents and an informed consent form were prepared to explain the objectives and importance of the survey, funding agency, project director, and institution. Participation was anonymous. Parents and students were assured of data confidentiality. The MIAS was completed without mentioning the participant's name to maintain anonymity.

Data Collection

Written permissions were obtained from the administrative heads of the secondary schools at each participating school. The information for parents and informed consent forms were sent to parents for consent. Consent and assent were obtained from the parents and students before the voluntary participation of the students. All participants were given a pen to complete the MIAS. A total of 600 participants (Grades 11 and 12) from three private and three public schools were invited to participate voluntarily in the present survey. Of the 600 students, 200 each were administered MIAS 18 and PSS 10, MIAS 18 and SES 10, and MIAS 18 and DASS -21. The response rate for MIAS 18 and PSS 10 was 181 (90.5%), MIAS 18 and RSES 10 was 198 (99%), and MIAS 18 and DASS-21 were 154 (77%). Complete data obtained from 533 (88.8%) students were included in the analysis. The combination of MIAS and DASS took an average of 35 minutes, and the other combined took 30 minutes for the students to complete the rating scales. The average time required to complete MIAS alone is 20 minutes.

Data Analysis

The free, open-source statistical software *Jamovi* version 2.3.24 was used to analyze the data. The tools' internal consistency reliability was assessed by computing Cronbach's alpha coefficient. Exploratory Factor Analysis (EFA) was used to identify the factor structure of MIAS 18. A confirmatory factor analysis was conducted to assess the fitness of the exploration model to the data. Pearson correlation coefficient was used to measure validity, correlating MIAS scores with scores on other tools.

RESULTS

A total of 533 participants responded to the MIAS. Of these respondents, 189 (35.5%) were male and 344 (64.5%) were female. There were 312 (59%) participants from the commerce stream and 221(41%) from the science stream. The participants included 240 (45%) students from grade 11 and 293 (55%) from grade 12. The age of the respondents ranged from 15 to 19 years (Mean = 16.70, SD = 0.71). The distribution of participants by grade, gender, and stream is shown in Table 1.

Table 1
Grade, stream and gender-wise distribution of participants

Grade	Gender	Stream of education		Total
		Commerce	Science	
		n (%)	n (%)	n (%)
Grade 11	Male	48 (39)	58 (49.6)	106 (44.2)
	Female	75 (61)	59 (50.4)	134 (55.8)
	Total	123 (100)	117 (100)	240 (100)
Grade 12	Male	52 (27.5)	31(29.8)	83(28.3)
	Female	137(72.5)	73(70.2)	210(71.7)
	Total	189 (100)	104 (100)	293 (100)
Total	Male	100 (32.1)	89 (40.3)	189 (35.5)
	Female	212 (67.9)	132 (59.7)	344 (64.5)
	Total	312 (100)	221 (100)	533 (100)

Source: Author's work

Dimensionality of MIAS

The scale's dimensionality was examined with Exploratory Factor Analysis and Confirmatory Factor Analysis (Floyd & Widaman, 1995; Furr, 2011; Singh et al., 2016).

Exploratory Factor Analysis (EFA) of MIAS

The sampling adequacy was examined prior to conducting the EFA. The Kaiser-Meyer-Olkin overall measure of sampling adequacy index was 0.948, well above the accepted level of 0.5 (Kaiser, 1970), Bartlett's test of sphericity was significant, $\chi 2(153, N = 533) = 4067$, $p<0.001$, indicating the adequacy of sample size and appropriateness of the correlation matrix for factor analysis. The 'Principal axis factoring' extraction method was used to measure the scores of the 18 items of MIAS. Eigenvalue > 1 and scree plot (Figure 1) were used as a basis to decide the number of factors to retain. It resulted in a single factor explaining 40.3% of the total variance.

Confirmatory Factor Analysis (CFA) of MIAS

A confirmatory factor analysis (Floyd & Widaman, 1995) was carried out to evaluate the fitness of our exploration model to the collected data. The parameters for this analysis were estimated through the maximum likelihood method, a statistically robust approach (B. M. Byrne, 1994). Using a chi-square goodness of fit test, we noted that the observed model was significantly different from the expected model, $\chi 2(135) = 510$, $p<0.001$.

However, it is important to consider that the significant result might be attributable to the large sample size. This notion is grounded in the fact that chi-square is sensitive to sample size, which can often lead to the rejection of the model even when

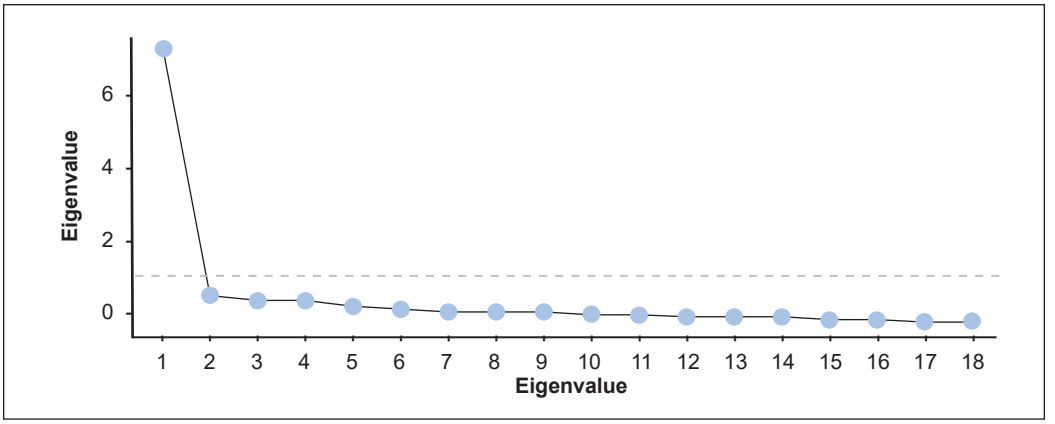

Figure 1. Scree plot indicating unidimensional model for the MIAS
Source: Author's work

Table 2
Findings of factor analysis for the MIAS 18 items (N = 533)

S. No	Items	Exploratory Factor Analysis		Confirmatory Factor Analysis		
		Factor Loadings	Uniqueness	Factor Loadings	95% CI	
					Lower	Upper
1	Pressure from teachers for better results.	0.608	0.631	0.693	0.603	0.783
2	Poor interest in a few subjects	0.621	0.615	0.707	0.617	0.796
3	Lack of concentration during studies.	0.671	0.549	0.830	0.734	0.927
4	Hesitant to get help from teachers.	0.574	0.670	0.714	0.614	0.815
5	Unable to discuss academics with parents.	0.731	0.466	0.984	0.883	1.084
6	The examination syllabus is very vast.	0.591	0.650	0.743	0.642	0.843
7	The study materials are confusing.	0.713	0.492	0.876	0.784	0.968
8	Lack of time for revision.	0.669	0.553	0.878	0.777	0.979
9	Lack of time for co-curricular activities or hobbies.	0.582	0.662	0.771	0.666	0.876
10	Fear of failure in exams	0.637	0.594	0.873	0.766	0.980
11	Hectic school timetable	0.668	0.554	0.875	0.774	0.976
12	Too frequent class tests	0.615	0.622	0.785	0.684	0.885
13	Distractions due to social media.	0.563	0.684	0.719	0.616	0.822
14	Competitive learning environment	0.594	0.648	0.754	0.653	0.855
15	Lack of guidance to prepare for the exam.	0.689	0.525	0.854	0.758	0.949
16	Parents' expectations about my performance.	0.657	0.569	0.886	0.780	0.992
17	Discussion and comparison among friends about how much revision has been done.	0.629	0.605	0.823	0.720	0.926
18	Academic queries from neighbors or relatives	0.587	0.655	0.825	0.712	0.938

Note. The 'Principal axis factoring' extraction method was used
Source: Author's work

the model has acceptable fit indices. Marsh et al. (1988) have therefore recommended the use of the Tucker-Lewis index (TLI) as a measure of relative fit that is relatively unaffected by sample size, a concept originally proposed by Tucker and Lewis (1973).

Therefore, we computed the TLI along with other commonly suggested fit indices such as the Comparative Fit Index (CFI), Root Mean Square Error of Approximation (RMSEA), and Standardized Root Mean Square Residual (SRMR). They provide different perspectives on model fit, with CFI and TLI focusing on relative fit and RMSEA and SRMR addressing absolute fit to evaluate how well the proposed model fits the observed data. The CFI measures model fit relative to a more restricted baseline model, typically the null model, which assumes no relationship among the variables. The TLI is a relative fit index that adjusts for the complexity of the model. It compares the fit of a specified model to a baseline model, taking into account the degrees of freedom. The RMSEA assesses how well a model approximates the data per degree of freedom. The SRMR is the standardized difference between the observed and predicted correlations. It is a measure of the mean absolute correlation residual. As Pituch and Stevens (2015) suggested, the thresholds for a good model fit include a CFI and TLI of 0.90 or higher, an RMSEA of 0.08 or lower, and an SRMR of 0.05 or lower.

In the context of the MIAS data, all these indices suggested an adequate fit to the original factor structure. Specifically, the CFI was 0.906, TLI was 0.893, RMSEA was 0.072 (with a 95% confidence interval of 0.066 to 0.079), and SRMR was 0.044. Furthermore, the factor loadings for each item in the CFA were greater than 0.6 and in the exploration factor analysis (EFA), the values were above 0.50, as illustrated in Table 2.

In conclusion, the data fit to our exploration model was confirmed and was in accordance with the original factor structure, suggesting that our model holds strong validity.

Reliability of MIAS

Cronbach's alpha is a measure of internal consistency. A value >0.70 or higher indicates acceptable reliability (Nunnally & Bernstein, 1994; Robinson et al., 1991). In the current study, the internal consistency of MIAS (18 items) was 0.923.

The item-wise MIAS summary is shown in Table 3. Item reliability of MIAS was further examined using the item-discrimination index. The corrected item to total correlation varied between 0.538 and 0.698. Suppose an item correlates highly with the total score. In that case, it suggests that individuals who score high on that item also tend to score high overall (and vice versa), indicating that the item is discriminative and valid and that it is a good contributor to the overall construct being measured (DeVellis, 2017; Nunnally & Bernstein, 1994). Generalized Discrimination index (Metsämuuronen, 2020) for Likert-type items based on the

top 27% and bottom 27% of the students on MIAS Score varied between 0.431 to 0.628. This index focuses more specifically on how well an item can distinguish between high- and low-scorers on the MIAS scale. High values on both measures would generally indicate a good, discriminative item. A discrimination index of 0.3 or greater is considered highly discriminated against. For MIAS, both measures for all 18 items were greater than 0.4, indicating a good discriminating ability (Table 3).

Concurrent and Convergent Validity of MIAS

The concurrent and convergent validity of the MIAS was examined by correlating its score with those from the Perceived Stress Scale (PSS), Rosenberg Self Esteem Scale (RSES), the Depression Anxiety Stress Scales-21 (DASS-21) and its subscales.

The internal consistency of RSES was 0.72, and that of PSS was 0.904. The overall reliability of DASS-21 was 0.923, with subscale reliabilities of 0.805 for

Table 3
Item-wise summary, discriminating index and corrected item to total correlation

Items	Mean	SD	Dis. Index*	Corrected item to total correlation	If the item dropped, Cronbach's alpha
1. Pressure from teachers for better results.	2.278	1.138	0.431	0.582	0.919
2. Poor interest in a few subjects	2.396	1.135	0.455	0.592	0.919
3. Lack of concentration during studies.	2.644	1.248	0.547	0.646	0.918
4. Hesitant to get help from teachers.	2.238	1.250	0.477	0.552	0.920
5. Unable to discuss academics with parents.	2.649	1.343	0.628	0.698	0.916
6. The examination syllabus is very vast.	2.081	1.261	0.484	0.568	0.920
7. The study materials are confusing.	2.326	1.226	0.536	0.682	0.917
8. Lack of time for revision.	2.743	1.308	0.559	0.638	0.918
9. Lack of time for co-curricular activities or hobbies.	2.405	1.315	0.510	0.555	0.920
10. Fear of failure in exams	2.409	1.373	0.592	0.610	0.919
11. Hectic school timetable	2.306	1.306	0.554	0.639	0.918
12. Too frequent class tests	2.405	1.273	0.497	0.588	0.919
13. Distractions due to social media.	2.330	1.279	0.479	0.538	0.920
14. Competitive learning environment	2.445	1.270	0.484	0.570	0.920
15. Lack of guidance to prepare for the exam.	2.174	1.247	0.540	0.662	0.917
16. Parents' expectations about my performance.	2.932	1.362	0.590	0.634	0.918
17. Discussion and comparison among friends about how much revision has been done.	2.443	1.313	0.536	0.606	0.919
18. Academic queries from neighbors or relatives	2.773	1.415	0.533	0.567	0.920

Note. *Generalized Discrimination index (Metsämuuronen, 2020)
Source: Author's work

Depression, 0.822 for Anxiety, and 0.903 for Stress, respectively (Table 4). The internal consistency of RSES was in the acceptable range, and all other tools have shown high internal consistency.

Pearson's Correlation coefficient (*r*) was used to measure validity. The coefficient (*r*) is a widely used measure of the linear relationship between two continuous variables. The coefficient quantifies the strength and direction of their relationship, ranging from -1 (perfect negative correlation) to 1 (perfect positive correlation). When *r* is close to 0, it indicates negligible or no linear relationship between the variables. Positive coefficients indicate that both variables vary in the same direction, whereas negative coefficients indicate that as one variable increases, the other decreases. J. Cohen (1992) provided guidelines for interpreting Pearson's *r* values: 0.10, 0.30, and 0.50, commonly indicative of small, medium, and large effects, respectively. Effect size provides insight into the practical significance of the coefficient.

The MIAS scores were correlated with PSS scores and the 'Stress' subscale of DASS-21 to establish concurrent validity. Concurrent validity is indicated if these correlations are positive, which was our hypothesis. This hypothesis was confirmed, with MIAS showing a significant positive correlation with PSS (r=0.789, p<0.001) and the 'Stress' Score from DA-SS21 (r=0.707, p<0.001; Table 4).

Convergent validity was examined next, assessing how well the new measure correlates with other theoretically aligned measures. As academic stress and self-esteem are constructs tied to individual perceptions of academic abilities and experiences, we expected a moderate negative correlation between MIAS scores and RSES scores. It was observed in the study that MIAS and RSES showed a significant negative correlation (r=-0.751, p<0.001; Table 4).

Further convergent validity testing was done by correlating MIAS scores with the DASS-21 scale and subscale scores. The

Table 4
Summary of scale scores, internal consistency and correlation with MIAS 18

Scales (no. of items)	Descriptive Statistics				Pearson's Correlation			
	n	Mean	SD	Alpha	MIAS	Stress	Anxiety	Depression
MIAS 18	533	43.98	15.20	0.923	1			
PSS 10	181	28.85	9.04	0.904	0.789**			
RSES 10	198	26.47	3.59	0.720	-0.751**			
DASS Scale and Subscales								
Stress 7	154	12.78	5.00	0.903	0.707**		0.644**	0.617**
Anxiety 7	154	11.56	3.90	0.822	0.678**			0.607**
Depression 7	154	11.36	3.68	0.805	0.629**			1
DASS-21	154	35.7	10.9	0.923	0.779**	0.897**	0.857**	0.837**

Note. **p<0.001
Source: Author's work

'Depression' (Ang & Huan, 2006; Liu & Tein, 2005; Sun et al., 2011) and 'Anxiety' (Ang & Huan, 2006) subscales of DASS-21 were chosen as criterion measures due to their known association with perceived academic stress. MIAS scores yielded significant positive correlations with the overall DASS-21 score (r=0.779, p<0.001) and all its subscales, suggesting that those perceiving greater academic stress also experienced greater anxiety (r=0.678, p<0.001) and depression (r=0.629, p<0.001). All correlation coefficients were >0.5 (Table 5), indicating a large effect size (J. Cohen, 1992), thus demonstrating good convergent validity.

Effectiveness of MIAS in Capturing Unique Stressors

The mean MIAS score (n=533) was 43.98, with a standard deviation of 15.20, showing a wide range of perceived academic stress among students.

The demographic variables, gender and grade were not associated with academic stress scores. Science stream students scored significantly higher on academic stress than students from the commerce stream (p=0.016, effect size=0.212; Table 5).

DISCUSSION

Validation of the MIAS

The Manipal Inventory of Academic Stress (MIAS) was specifically developed to address higher secondary students' unique academic stressors in Karnataka, India. Its comprehensive assessment capabilities, high internal consistency (Cronbach's alpha of 0.923), and good discriminating ability make it a robust tool for identifying academic stress. Previous studies have highlighted the importance of context-specific tools in accurately capturing the stressors unique to particular demographics (Renk & Smith, 2007; Stallman & Hurst, 2016). With its tailored design, the MIAS fills a critical gap in the available instruments for measuring academic stress in Indian students. Evidence from EFA and CFA validates the unidimensional model fit of

Table 5
Demographic variable associated with MIAS Score

Variable Category	n	Mean (SD)	t	p-value	95% CI of Mean difference	Effect Size (Cohen's d)
Gender						
Male	189	43.2 (14.9)	0.86	0.389	-1.52 to 3.89	0.078
Female	344	44.4 (15.3)				
Grade						
Grade 11	240	44.5 (15.9)	0.67	0.505	-1.72 to 3.48	0.058
Grade 12	293	43.6 (14.7)				
Stream						
Commerce	312	42.7 (15.5)	2.41	0.016	0.587 to 5.81	0.212
Science	221	45.9 (14.6)				

Source: Author's work

the revised MIAS and supports the use of the MIAS total score to identify students under high academic stress.

Concurrent and Convergent Validity

The MIAS score correlates positively with the PSS score, DASS-21 overall score and its subscale scores, and negatively with the RSES score, demonstrating strong concurrent and convergent validity. It aligns with existing literature that supports the positive correlations of perceived academic stress scale scores with depression, anxiety, and stress indicators and the negative correlation with self-esteem (Ang & Huan, 2006; D. G. Byrne et al., 2007; Noreen et al., 2021; Stallman & Hurst, 2016; Sun et al., 2011). These associations substantiate the construct validity of the MIAS, indicating that those perceiving higher academic stress also experience higher levels of depression, anxiety, and stress and lower self-esteem.

Findings on Demographic Factors

The present study did not find significant gender differences in academic stress levels, contrasting with previous literature that typically reports higher stress levels among female students (Chyu & Chen, 2022; García-Ros et al., 2018; Jiang et al., 2021; Pant et al., 2023; Ye et al., 2018). This unexpected finding could be attributed to evolving gender roles in the Indian context, increased support systems for female students, or shifts in societal norms that affect stress perception and reporting. Further research is needed to explore these possibilities and understand the underlying factors. The study revealed significantly higher stress levels among science stream students than commerce students, aligning with existing literature indicating students' intense pressure in science streams (Bhat et al., 2018; Mayya, Martis, et al., 2022). However, no significant grade-wise difference was noted, suggesting that stress levels might be influenced more by the stream of education rather than the academic grade. This finding contrasts with previous studies that reported higher stress levels among students in higher grades (Pant et al., 2023). Overall, these results highlight the need for targeted interventions to address academic stress among students based on their specific demographic characteristics.

CONCLUSION

The Manipal Inventory of Academic Stress (MIAS) has been validated as a reliable and effective tool for assessing academic stress among higher secondary students in Karnataka. Its high internal consistency and strong correlations with other established measures underscore its value in research and practical contexts. By capturing the unique stressors faced by this demographic, the MIAS serves as a critical instrument for early detection and intervention in academic stress management.

Refining the MIAS to an 18-item scale significantly enhances its accuracy and contextual relevance. This improved precision enables the identification of specific stressors unique to Indian higher secondary students, facilitating targeted interventions. The refined MIAS more

effectively captures the multifaceted nature of academic stress, including workload, peer pressure, and examination anxiety, offering deeper insights into its determinants.

Future studies should build on these findings to further support students' mental health and academic success. By expanding the use of MIAS and exploring its application in diverse educational settings, researchers can develop more effective, context-specific interventions for managing academic stress.

Implications for Practice

The refined MIAS offers a reliable and contextually relevant tool for early detection of high academic stress among Indian higher secondary students, aiding educators, counselors, and mental health professionals. Its application facilitates targeted and effective interventions, including stress management programs and counseling services tailored to students' unique needs. For instance, students scoring high on the MIAS can receive targeted counseling sessions to address specific stressors. Evidence-based interventions such as Mindfulness-Based Stress Reduction (MBSR) have been shown to reduce stress, anxiety, and depression by promoting mindfulness and self-awareness (Hazlett-Stevens & Oren, 2017; Hofmann & Gómez, 2017). Mindfulness-Based Interventions (MBI) effectively address behavioral issues and other stressful situations (Hosseinian & Nooripour, 2019; Nooripour et al., 2021), reducing academic stress and enhancing cognitive and emotional outcomes (Fulambarkar et al., 2023; Fung et al., 2019; Goyal et al., 2023). Cognitive-Behavioral Therapy (CBT) helps students develop coping strategies to manage stress and negative thought patterns (Demir & Ercan, 2022; Stallard, 2022). Social and Emotional Learning (SEL) programs enhance emotional intelligence, resilience, and interpersonal skills, mitigating academic stress (Green et al., 2021; Vestad & Tharaldsen, 2022). Holistic stress management programs, including yoga, meditation, and relaxation techniques, address stress's physical, mental, and emotional aspects (Rentala et al., 2019; Zisopoulou & Varvogli, 2023). School-based interventions, such as stress management workshops, peer support groups, and counseling services, have effectively reduced stress and improved well-being (Beauchemin, 2018; Feiss et al., 2019; Stallman et al., 2019). These programs can be tailored to address the specific stressors identified by the MIAS, providing a targeted and effective approach to stress management.

Limitations and Recommendations for Future Research

Despite its contributions, this study has limitations. The sample was confined to higher secondary students in Karnataka, which may limit the generalizability of the findings to other regions or educational levels. Further, the study's cross-sectional nature restricts the ability to infer causality between academic stress and its potential effects. Moreover, potential biases or confounding variables such as

socioeconomic status or parental education were not addressed, which might have impacted the results. Furthermore, self-reporting bias may have influenced the accuracy of the reported stress levels.

Future research should aim to replicate this study in diverse geographical and cultural settings to enhance the generalizability of the MIAS. Longitudinal studies are recommended to better understand academic stress's causal relationships and long-term effects. Qualitative methods like interviews and focus groups can provide deeper insights into students' experiences and coping strategies. Exploring other potential demographic factors, such as socioeconomic status and parental education, could provide a more comprehensive understanding of academic stress determinants.

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