Canadian Journal of Educational and Social Studies
Vol. 4(4), 2024, pp. 67-81

Development and Validation of a Stress Measurement Scale with the Prospective Teachers of West Bengal, India

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DOI: 10.53103/cjess.v4i4.261

Abstract

Mental stress among prospective teachers in teacher education is a significant concern. They face academic pressures, professional expectations, and personal commitments, which can impact their psychological well-being. Thus, it is imperative to develop a validated stress measuring tool in order to assess the stress levels of prospective teachers in West Bengal, India. Developing a stress scale for assessing prospective teachers' mental stress levels was the aim of the present study. In order to gather the data, fifty (50) prospective teachers from West Bengal, India were given a self-administered version of the twenty-eight (28) item mental stress scale. After the data was collected, item analysis was performed on the stress scale to eliminate the poor items. After that, the internal consistency of the final scale was assessed using the 237 participants (prospective teachers) in the Cronbach's alpha method. After item analysis, the scale had 25 items left on it, covering the five mental stress scale sub-dimensions (Working Conditions, Role ambiguity & conflict, Responsibility, Relationship and Organizational Climate). A high degree of statistically significant correlation was found in the scale's final iteration, with alpha values of 0.939. Based on the results, researchers and educators can effectively assess the psychological stress level of prospective teachers by using the Stress Scale. The development and validation of a stress measuring instrument specifically designed for the prospective teachers of West Bengal is a significant advancement in educational research and practice.

Keywords: Development, Prospective Teacher, Stress Scale, Validation

Introduction

Teachers play an indisputable and important role in the field of education as agents of knowledge transmission and character formation. Teaching is the gateway to learning (Ray & Sikdar, 2023). But beneath the ideal of the noble teaching profession is a reality

full of difficulties and demands that have a significant negative influence on teachers' well-being, especially for those who are just starting out in their careers. The teaching profession can be highly stressful, potentially leading to reduced job satisfaction, burnout, and poor work performance (Agyapong, et al., 2022). Teachers are a highly stressed professional group, often experiencing more than average psychological and psychosomatic complaints (Scheuch et al., 2015; Wettstein, et al., 2021). Teacher's instructional behavior is influenced by their attitude and emotional self-regulation, with stress and emotional exhaustion, a key symptom of burnout, negatively impacting students' learning and achievement (Caprara et al., 2006; Frenzel et al., 2009; Kunter et al., 2013; Klusmann et al., 2016; Wettstein, et al., 2021).

The teaching profession is a significant force in shaping future generations, but it also presents significant challenges, including stress, which can significantly impact the mental, emotional, and physical health of prospective teachers. Teaching is a profession characterized by high stress levels, exposing student teachers to situations similar to or more stressful than practicing teachers (Black-Branch & Lamont, 1998). This stress is crucial in understanding the dynamics of educational environments worldwide, as these educators-in-training navigate a demanding landscape with responsibilities, expectations, and complexities. Student teacher stress is crucial as it impacts teacher behavior, classroom effectiveness, and student achievement, leading to decreased rapport, reduced achievement, and increased anxiety (Solanki, 2018). The stress experienced during this formative phase can affect individual well-being, educational outcomes, and the quality of teaching. Prospective teachers face daily stressors like media exposure, family issues, and school pressures like rising expectations, bullying, and peer pressure (Aung, 2018).

Stress is a mental or emotional strain resulting from demanding circumstances, arising from both external and internal factors. It can manifest in physical symptoms, emotional symptoms, and behavioral changes. Stress can be acute or chronic, and its experience is subjective. Prolonged or intense stress without adequate coping mechanisms can lead to negative consequences for mental and physical health. Managing stress through relaxation techniques, exercise, social support, and time management is crucial for overall well-being and resilience.

Bachelor of Education program, which is a professional degree course, provides practical and theoretical knowledge of their profession (Vijayalakshmi, 2018; Vijayalakshmi, 2022). Teacher Education plays the pivotal role in developing what skills and in order to produce qualified teacher (Ray, et al., 2023). Mental stress among prospective teachers in teacher education is a significant concern. Teacher training institutions overload student teachers with excessive homework, leading to stress, anxiety, and negative personal traits (Prabha & Vasanthpriyadharsan, 2020). They face academic pressures, professional expectations, and personal commitments, which can impact their psychological well-being. Transitioning from student to educator involves navigating

uncertainties about future career prospects and adapting to classroom management and student interactions. Gardner (2010) examined 21st century psychological distress, demands associated with the student-teachers' practicum, the impact of distress, and strategies presented for coping and well-being, and stated that stress levels among practicing teachers are high (Gardner, 2010). Addressing these stressors is crucial for the health and resilience of teachers and the quality of education they will provide. Targeted interventions, mentorship programs, and stress management strategies can help foster a positive learning environment within teacher education programs. Student-teachers may also experience stress associated with job demands when they attend schools for practice teaching., as found in a UK study with secondary school student teachers (Chaplain, 2008; Gardner, 2010). Australian student-teachers do engage in practice teaching in schools and have reported stress associated with the practicum (Murray-Harvey, et al., 1999; Gardner, 2010). Canadian teachers, like their global counterparts, also experience high-stress levels (Agyapong, et al., 2022).

In West Bengal, India, where prospective teachers go through rigorous training against a backdrop of varied societal, professional, and personal expectations, this concern is especially relevant. Teaching is becoming more and more recognized as a demanding profession that requires educators to navigate a complex web of duties, obstacles, and expectations. Teachers' mental and emotional well-being can be severely impacted by these pressures, which can have an impact on their personal lives, professional efficacy, and the standard of education that is taught to future generations. A multitude of stressors, from professional expectations and academic pressures to personal struggles and societal demands, characterize the transition from student to educator for prospective teachers in West Bengal.

The development and validation of a stress measurement scale for prospective teachers in West Bengal is a significant educational initiative. This scale offers a systematic and standardized approach to assess the unique stressors faced by teachers preparing to enter the teaching profession. By identifying and quantifying these stressors, researchers, educators, policymakers, and mental health professionals can gain deeper insights into the factors contributing to stress among prospective teachers. The paper provides a comprehensive overview of stress measurement in educational contexts, exploring the theoretical framework, specific stressors, methodological rigor, and potential applications. The aim is to contribute to a deeper understanding of stress among prospective teachers, offering practical insights and recommendations for fostering a supportive environment for current and future educators.

Method and materials

Design

In pilot studies, convenience sample is usually used because it allows the

researcher to obtain basic data and trends regarding his study without the complication of using a randomized sample (Anonymous, 2009). So, the researcher has used Convenience sampling technique for the collection of relevant data in the present study.

Participants

A population is a group of individuals with a common characteristic, and a representative sample is obtained by selecting each unit under controlled conditions (Best, et al., 2018). In order to analyze the draft scale's items, the researcher administered the scale to fifty (50) prospective teachers of West Bengal. After that, the final draft's internal consistency was measured through the Split-Half method and Cronbach's alpha, which were applied to 237 prospective teachers of West Bengal.

Instrument Formation

Item Pool

The researcher comprised item generation adopted using deductive (adopted from previous studies) and inductive methods (ethnographic analysis of consumer reviews) approaches (Dastane et al., 2023). The items were evaluated by experts and resource persons for their purpose, language clarity, intensity, and appropriateness. The Mental Stress questionnaire was then constructed using a group of thirty-three statements for the pre-try-out phase, covering five sub-dimensions: Working Conditions, Role ambiguity & conflict, Responsibility, Relationship and Organizational Climate. Among the five sub-dimensions of the entire item-pool, the researcher made a consistent effort to maintain a balance.

Scoring Technique

The stress scale is a five-point scale. The five alternative responses were kept for each item in the Stress scale, ‘No Stress’, ‘Mild Stress’, ‘Moderate Stress’, ‘Much Stress’ and ‘Extreme Stress’. The score of each item was distributed as ‘No Stress’=’0’, ‘Mild Stress’=’1’, ‘Moderate Stress’=’2’, ‘Much Stress’=’3’ and ‘Extreme Stress’=’4’. Accordingly, for each item, the lowest number is ‘0’and the highest number is ‘4’.

Pre-Try out

The Mental Stress Scale in its preliminary form was administered to forty participants from the selected sample area of West Bengal, who represented all the independent variables selected for this study. This study aimed to identify any barriers that Mental Stress Scale respondents faced when responding to particular statements. The statements may be unclear or confusing, the language used in the items may be complex,

or the statement may have more than one meaning and call for different answers. The pre-tryout participants' answers provided the basis for additional screening, analysis, and statement editing. The expert and resource people's opinions were sought in order to remove any ambiguity and improve the clarity of the statements' language. In this way, each item was scrutinized and refined to make it more user-friendly for respondents. Twenty-eight (28) items from the Mental Stress Scale were then kept for the last round of tryouts.

Try Out

The scale is considered ready for its experimental try-out; the items have been added and adjusted in response to the experts' recommendations and criticisms (Singh, 2019). The scale was then administered to fifty (50) prospective teachers from the selected sample area in order to conduct item analysis.

Administration of Draft Scale

The questionnaire was provided to the participants, along with instructions to read it carefully and enter their answers in the boxes that accompanied each statement. The appropriate weights assigned to each statement were used to accumulate the scores for each one.

Processing of Data

Data entry was done using Microsoft Excel 2010. Excel data analysis tool pack has been used for item analysis. For reliability analysis, the data were subsequently loaded into IBM SPSS version 23.0.

Statistical Analysis

The poor items from the Mental Stress Scale have been removed using an item analysis method, and a standardized Mental Stress Scale with good items has been created. The poor items on the scale were removed from the study by the researcher through item analysis using the t-test. Next, the test's reliability was assessed using Cronbach's alpha and the Split-half method. The researcher also used Tukey test for non-additivity.

Result

Item Analysis

Item analysis is a classic technique used to develop and refine psychological or educational scales. It is also referred to as the method of extreme groups, or Kelley method.

It assists in finding test or scale items that most effectively distinguish between high and low scorers. Upper and lower groups consisting of twenty-seven percent (27%) from the extremes of the criterion score distribution is optimal for the study of test items, provided the differences in criterion scores among the members of each group are not utilized (Kelley, 1939). It has been demonstrated that using a value of 27% will maximize differences in normal distributions while offering sufficient cases for analysis (Wiersma & Jurs, 1990; Hetzel, 1997; Ray & Sikdar, 2024). The Kelley method is a crucial tool for item analysis in scale development, aiding in identifying items that differentiate high and low scorers, ensuring the items retained contribute to the scale's overall discriminative power. The respondents in the top and bottom 27% of the orderly ranked list with the highest and lowest test scores group, respectively, are identified. A reliable statistical technique for evaluating item discrimination through a comparison of extreme group means is the *t*-test. It shows the statistical significance of any discrimination between high and low scorers in addition to whether or not an item discriminates in this way. This method can work wonders when combined with the Kelley method to validate and improve a scale (Kelley, 1939).

Table 1: Discrimination between upper group and lower group

Items	**Groups**	**X**	**σ**	***df***	***t***	***p***
MS1	Highest Group	2.21	1.48	26	0.81	0.424
	Lowest Group	1.79	1.31			
MS2	Highest Group	2.29	0.99	26	2.55	0.017*
	Lowest Group	1.36	0.93			
MS3	Highest Group	3.07	1.07	26	4.29	0.000**
	Lowest Group	1.50	0.85			
MS4	Highest Group	2.21	1.53	26	2.04	0.052
	Lowest Group	1.07	1.44			
MS5	Highest Group	2.64	1.08	26	3.97	0.001**
	Lowest Group	1	1.11			
MS6	Highest Group	3.50	0.52	26	10.65	0.000**
	Lowest Group	0.86	0.77			
MS7	Highest Group	2.86	0.95	26	4.42	0.000**
	Lowest Group	0.93	1.33			
MS8	Highest Group	2.21	1.12	26	6.24	0.000**
	Lowest Group	0.21	0.43			
	Highest Group	3.14	0.77			

MS9	Lowest Group	2.29	1.20	26	2.24	0.000**
MS10	Highest Group	3.14	0.86	26	7.6	0.000**
	Lowest Group	0.71	0.83			
MS11	Highest Group	2.71	0.91	26	6.41	0.000**
	Lowest Group	0.71	0.73			
MS12	Highest Group	3.14	0.66	26	5.54	0.000**
	Lowest Group	1.21	1.12			
MS13	Highest Group	3.29	0.83	26	5.07	0.000**
	Lowest Group	1.14	1.35			
MS14	Highest Group	2.79	0.97	26	6.38	0.000**
	Lowest Group	0.71	0.73			
MS15	Highest Group	2.79	0.80	26	2.42	0.023*
	Lowest Group	1.57	1.70			
MS16	Highest Group	3.21	0.80	26	5.01	0.000**
	Lowest Group	1.07	1.38			
MS17	Highest Group	2.86	0.66	26	9.81	0.000**
	Lowest Group	0.43	0.65			
MS18	Highest Group	3.36	0.84	26	11.11	0.000**
	Lowest Group	0.43	0.51			
MS19	Highest Group	2.71	0.91	26	3.73	0.001**
	Lowest Group	1.36	1.01			
MS20	Highest Group	3.21	0.89	26	9.77	0.000**
	Lowest Group	0.36	0.63			
MS21	Highest Group	2.79	1.37	26	3.90	0.001**
	Lowest Group	0.93	1.14			
MS22	Highest Group	3.07	1.00	26	6.28	0.000**
	Lowest Group	0.86	0.86			
MS23	Highest Group	3.00	0.78	26	4.36	0.000**
	Lowest Group	1.50	1.02			
MS24	Highest Group	3.14	0.77	26	7.98	0.000**
	Lowest Group	1.14	0.53			

MS25	Highest Group	2.79	0.97	26	5.01	0.000**
	Lowest Group	1.07	0.83			
MS26	Highest Group	3.07	1.00	26	1.83	0.078
	Lowest Group	2.14	1.61			
MS27	Highest Group	2.86	0.95	26	2.88	0.008**
	Lowest Group	1.71	1.14			
MS28	Highest Group	3.36	0.63	26	3.98	0.000**
	Lowest Group	2.00	1.11			

Note: ** 0.01 level of significance; * 0.05 level of significance; MS means Mental Stress

Table 1 indicates that there are no statistically significant differences between the highest and lowest scoring groups for three (3) items (MS1, MS4, and MS26) on the Mental Stress Scale of Prospective Teachers. As a result, these items were eliminated from the scale. Two (2) items (MS2 and MS15) in the remaining set of items have significant differences between the highest and lowest scoring groups according to the "0.05 level of significance" rule; twenty-three (23) items in the Mental Stress Scale have significant differences between the highest and lowest scoring groups according to the "0.01 level of significance" rule. Consequently, twenty-five (25) were kept for the final version of the Mental Stress Scale, which includes five dimensions: Working Conditions, Role ambiguity & conflict, Responsibility, Relationship and Organizational Climate.

Validity

Validity is the degree to which scores on an appropriately administered instrument support inferences about variation in the characteristic that the instrument was developed to measure (Cizek, 2012). Expert validation was conducted at the initial stage to ensure face and content validity for the scale of Mental Stress (MS) (Ciccehetti & Sparrow, 1981). Semantic validation is a crucial step in research to confirm the effectiveness of a scale applied to the target sample, involving opinions from resource persons and experts to remove ambiguity (Hair, et al., 2019; Ray & Sikdar, 2023).

Reliability

Following the analysis, 25 items remained on the scale, these 25 items were covered five sub-dimensions of mental stress scale. To evaluate the internal consistency of the final Mental Stress scale, the researcher employed the Split-half method, Cronbach alpha, and Tukey's Test for Non-additivity.

The assumption behind the coefficient of internal consistency is that items measuring the same construct should correlate, thereby providing an estimate of measurement reliability (Kimberlin & Winterstein, 2008). A suitable index of equivalency, except for brief tests of the test's first factor concentration, is determined by estimating the correlation between two random samples of items drawn from a universe of items similar to those in the test, using alpha (α) (Cronbach, 1951). In the present investigation, Cronbach's alpha was utilized to assess the internal consistency of the scale, as presented in the table below.

Table 2: Results of the Cronbach Alpha reliability of the mental stress and its sub-dimensions

Dimensions	**n**	**Total Item**	**Cronbach's Alpha**
Working Conditions	237	1	-
Role ambiguity and conflict	237	4	0.783
Responsibility	237	3	0.641
Relationship	237	10	0.907
Organizational Climate	237	7	0.862
Mental Stress Scale	**237**	**25**	**0.939**

According to table 2, it can be observed that the Cronbach's Alpha values of the Mental Stress Scale is 0.939. It was not possible to calculate the alpha value of the first dimension (Working Conditions) because there was only one item retained after item analysis. The remaining dimensions viz., Role ambiguity & conflict, Responsibility, Relationship and Organizational Climate had Cronbach's alpha value of 0.783, 0.641, 0.907 and 0.862 respectively.

Table 3: Split-Half Reliability Results (Cronbach's Alpha for two halves, Correlation between Forms, Spearman Brown Coefficient, Guttman Split-Half Coefficient) for Mental Stress Scale

Reliability Statistics

Cronbach's Alpha	Part 1	Value	.890
		N of Items	13[a]
	Part 2	Value	.905
		N of Items	12[b]
	Total N of Items		25
Correlation Between Forms			.775
Spearman-Brown Coefficient	Equal Length		.873
	Unequal Length		.874
Guttman Split-Half Coefficient			.873

a. The items are: VAR00001, VAR00002, VAR00003, VAR00004, VAR00005, VAR00006, VAR00007, VAR00008, VAR00009, VAR00010, VAR00011, VAR00012, VAR00013.

b. The items are: VAR00013, VAR00014, VAR00015, VAR00016, VAR00017, VAR00018, VAR00019, VAR00020, VAR00021, VAR00022, VAR00023, VAR00024, VAR00025.

From the table 3, it is observed that Cronbach's alpha coefficients for the test's first and second halves were found to be 0.890 and 0.905, respectively, using the split-half method. The Spearman-Brown coefficient was found to be 0.873 and .874 for equal and unequal lengths respectively. Furthermore, 0.873 was found to be the Guttman Split-Half Coefficient.

The analysis's Cronbach Alpha coefficient should be at least 0.60, the correlation coefficient between 0.20-0.90, and the Spearman-Brown coefficient higher than 0.70 in order to ensure internal consistency and reliability (Duzgun & Kirkic, 2023; Hinkin, 1995; Ray & Sikdar, 2023).

Table 4: Present the Items interaction through Tukey's test for nonadditivity

ANOVA with Tukey's Test for Nonadditivity

			Sum of Squares	df	Mean Square	F	Sig
Between People			3516.825	236	14.902		
Within People	Between Items		731.643	24	30.485	33.640	.000
	Residual	Nonadditivity	.654[a]	1	.654	.722	.396
		Balance	5132.183	5663	.906		
		Total	5132.837	5664	.906		
	Total		5864.480	5688	1.031		
Total			9381.305	5924	1.584		

Grand Mean = 1.8770

a. Tukey's estimate of power to which observations must be raised to achieve additivity = 1.073.

The Tukey test for nonadditivity is a crucial tool in experimental design that evaluates the significance of interaction effects between two factors in an experiment (Montgomery, 2012). It helps researchers identify which factor levels significantly impact the outcome variable, providing valuable insights into the results and guiding further investigation or condition adjustment. According to table 4, it can be observed that the items interaction is statistically significant.

Final Scale

The final scale of Mental Stress consists twenty-five (25) items in five dimensions viz., Working Conditions, Role ambiguity & conflict, Responsibility, Relationship and Organizational Climate. The distributions of the items are shown in Table 6.

Table 5: Distribution of items in the final scale of mental stress

Sl. No.	**Dimension**	**Item code**	**Total items**
1	Working Conditions	MS1	1
2	Role ambiguity and conflict	MS2, MS3, MS4, MS5	4
3	Responsibility	MS6, MS7, MS8	3
4	Relationship	MS9, MS10, MS11, MS12, MS13, MS14, MS15, MS16, MS17, MS18	10
5	Organizational Climate	MS19, MS20, MS21, MS22, MS23, MS24, MS25	7
Total			**25**

Discussion

A stress measurement scale with twenty-eight (28) items was given during the try-out phase to gather data for item analysis after the pre-try-out phase. According to Verma, the item's DI value should be used to determine the item's quality (Varma, 2019; Chaudhuri, et al., 2023). The *t*-test is a trustworthy statistical method for assessing item discrimination by comparing the extreme group means (Baidya & Ray, 2024). Table 1 reveals that three items (MS1, MS4, and MS26) on the Mental Stress Scale having *df* 26 with *t* values of 0.81, 2.04, and 1.83, respectively, are insignificant at both the 0.05 and 0.01 level of significance (Garret, 1984). The remaining 25 items are significantly differed between highest and lowest scores group. These items are retained in the final stress scale covering five dimensions (Working Conditions, Role ambiguity & conflict, Responsibility, Relationship and Organizational Climate). Twenty-one (25) items from the stress measurement scale were kept in the final version. The Stress Scale is validated by high reliability and high positive correlation (Guttman Split-Half Coefficient = 0.873 and Cronbach alpha = 0.939) (Mangal, 2019; Duzgun & Kirkic, 2023; Hinkin, 1995; Ray & Sikdar, 2023).

Implications

The design of this study will help develop a different psychological scale to assess the motivation, fatigue, academic stress, job satisfaction, anxiety, and other factors of prospective teachers. With further research, the Mental Stress Scale developed for this study will help collect data regarding the mental stress levels of prospective teachers. Teacher educators can measure the mental stress levels of prospective teachers with the help of this scale.

Conclusion

To conclude, the development and validation of a stress measuring instrument tailored for prospective teachers in West Bengal is considered a notable advancement in the field of educational research and practice. This scale has been meticulously developed to accurately assess the specific stressors faced by prospective teachers in this region through rigorous validation processes and design. Through the provision of a standardized instrument, mental health practitioners, educators, and legislators can acquire important knowledge about the stress levels of aspiring teachers, which will allow for the development of focused interventions and support networks. By enhancing the resilience and general well-being of prospective teachers, this scale's implementation is expected to improve the educational landscape of West Bengal by fostering a more conducive environment for educational instruction.

Acknowledgements

We are particularly appreciative of and grateful to Dr. Santosh Mukherjee, Principal of Krishnanagar B. Ed. College, Nadia, West Bengal, for his introspective suggestions. We also want to express our gratitude to the prospective teachers who took part in this study as they made it possible for us to successfully complete our research.

Conflict of Interest: Authors have stated that there are no conflicting interests.
Funding: None.

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