Academic Stress, Self-efficacy and Anxiety: A Study on Mathematics of Higher Secondary Level Students in Purulia District of West Bengal, India

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Abstract

The purpose of this study is to compare Academic Stress, Self-efficacy in mathematics and Anxiety in mathematics among higher secondary level students of Purulia District of West Bengal, India. Five independent variables sex (boys and girls), class (XI and XII), family type (joint and Nuclear), residence (urban and rural) and stream (science and arts) are considered for this study. To compare above mentioned variables Levenes' test of homogeneity of variance and Shapiro-Wilk test of normality are done. Appropriate tests are administered to test null hypotheses. For most of the cases there are no statistically significant differences are found.

Key words: Academic Stress, Self-efficacy, Anxiety, Mathematics and Higher Secondary.

Introduction

Academic stress is a very common factor to the majority of the students forever. Self-efficacy and anxiety in mathematics are also very important factors in learning mathematics especially for higher secondary level students in India. Present study is done in Purulia District of West Bengal, India by collecting data on academic stress, self-efficacy and anxiety in mathematics from higher secondary level students.

Literature Review

Academic stress, self-efficacy and anxiety are three important aspects of mathematics learning. Several researchers investigated those fields according to their interests. Academic stress among university students is studied by Bedewy and Gabriel (2015). Izzati, Tentama and Suyono (2020) constructed a scale which has four components, namely biological, cognitive psychosocial, psychosocial emotion, and psychosocial behavior and all components and indicators were able to reflect and build academic stress variables. A study on academic stressors and reactions to stressors between American and international students is done by Misra and Castillo (2004). Different difficulties of academic stress are mentioned by different researchers (Lee & Larson (2000), (Kadapatti & Vijayalaxmi, 2012), Alam and Halder (2018), Khan and Kausar (2013) and Nadamuri & Ch (2011)). Putwain (2007) investigated the issue of academic stress in school children and how it may affect emotional well-being, health and performance on school assessments.

Different researchers pointed out different factors of self-efficacy (Kundu and Ghose (2016) and Hodges (2008)). Self-efficacy and Anxiety on mathematics is studied by Venkatesan and Karimi (2010), Yadav (2018) and Deb et al. (2014). According to Ma and Xu (2003), mathematics anxiety was related to students' feelings such as tension, panic and fear towards mathematics (Hughes, 2016). Kargar, Ahmad and Bayat (2010) opined that students avoid mathematics classes due to anxiety and ability of their problem solving is affected. Different studies showed that Anxiety in mathematics reduces the different types of ability in mathematics ((Puteh and Khalin (2016), Ashcraft and Moore (2009)).

Research Gap

Authors have found no evidence of any study covering academic stress, self-efficacy and anxiety in mathematics of higher secondary level students of Purulia District, West Bengal, India.

Objectives of the study

Objectives of the study are to compare the academic stress, self-efficacy and anxiety in mathematics between dichotomous variables like boys-girls, XI-XII, joint-nuclear, urban-rural and science-arts of higher secondary level students of Purulia District of West Bengal, India.

Hypotheses

To compare academic stress, self-efficacy and anxiety in mathematics between different groups following hypotheses are framed:

H_{01}: There is no significant difference in academic stress between higher secondary level boys and girls.

H_{02}: There is no significant difference in self-efficacy in mathematics between higher secondary level boys and girls.

H_{03}: There is no significant difference in anxiety in mathematics between higher secondary level boys and girls.

H_{04}: There is no significant difference in academic stress between higher secondary level urban and rural students.

H_{05}: There is no significant difference in self-efficacy in mathematics between higher secondary level urban and rural students.

H_{06}: There is no significant difference in anxiety in mathematics between higher secondary level urban and rural students.

H_{07}: There is no significant difference in academic stress between higher secondary level science and arts students.

H_{08}: There is no significant difference in self-efficacy in mathematics between higher secondary level science and arts students.

H_{09}: There is no significant difference in anxiety in mathematics between higher secondary level science and arts students.

H_{10}: There is no significant difference in academic stress between higher secondary level class-XI and class-XII students.

H_{11}: There is no significant difference in self-efficacy in mathematics between higher secondary level class-XI and class-XII students.

H_{12}: There is no significant difference in anxiety in mathematics between higher secondary level class-XI and class-XII students.

H_{13}: There is no significant difference in academic stress between higher secondary level joint and nuclear families students.

H_{14}: There is no significant difference in self-efficacy in mathematics between higher secondary level joint and nuclear families students.

H_{15}: There is no significant difference in anxiety in mathematics between higher secondary level joint and nuclear families students.

Methodology

1. **Scale uses:**

Academic Stress Scale (ASS):

The scale ASS developed by Mustafa (2003) retrieved from Viqar (2012) was used for the present study. This scale consisted of 34 items each relates to specific characteristics of academic stress. Responses were obtained on type 5-point Likert scale ranging from 4 for "very much", 3 for "much" 2 for "somewhat" 1 for "slightly" and 0 for "not at all".

Mathematics self-efficacy and anxiety questionnaire (MSEAQ):

The scale MSEAQ was developed by Diana K May (2009) to assess the student`s perception of Mathematics self-efficacy and anxiety and their feeling of anxiety towards Mathematics is used for determining self-efficacy and anxiety in mathematics. This scale consisted of 29 items each related to measurement of mathematics self-efficacy and anxiety. The items number - 1, 4 7, 9, 10, 12, 13, 16, 19, 20, 21, 23, 28, 29 are

measured the mathematics self-efficacy of the learner and the items number- 2, 3, 5, 6, 8, 11, 14, 15, 17, 18, 22, 24, 25, 26, 27 are measured the mathematics anxiety of the learner.

2. **Data collection**

Data collected from the students by random sampling method.

3. **Statistical Techniques used**

Descriptive and inferential statistics are used to understand the nature of the data and to calculate central tendencies, a test of equal variances and a test of normality to ensure which tests are appropriate for the present work. To test the hypotheses, t-test and Mann-Whitney U Test are used.

Results and Discussions

Independent variable	Frequency	Dependent variable	Mean	Standard Deviation
Boys	146	Academic Stress	51.22	19.205
		Self-efficacy	42.91	11.841
		Anxiety	36.21	10.310
Girls	84	Academic Stress	51.55	16.447
		Self-efficacy	43.60	11.013
		Anxiety	39.06	10.503
Urban	146	Academic Stress	49.70	17.442
		Self-efficacy	42.90	11.533
		Anxiety	37.24	11.113
Rural	84	Academic Stress	54.19	19.248
		Self-efficacy	43.61	11.569
		Anxiety	37.26	9.248
Joint family	94	Academic Stress	46.63	17.097
		Self-efficacy	42.99	12.877
		Anxiety	35.78	11.053
Nuclear family	136	Academic Stress	54.60	18.303
		Self-efficacy	43.28	10.539
		Anxiety	38.26	9.925
Class –XI students	164	Academic Stress	49.30	16.818
		Self-efficacy	43.87	12.008
		Anxiety	36.63	11.004
Class-XII students	66	Academic Stress	56.39	20.558
		Self-efficacy	41.41	10.103

		Anxiety	38.77	8.816
Streams - Science	166	Academic Stress	51.39	18.919
		Self-efficacy	43.69	11.876
		Anxiety	36.23	10.5.9
Streams -Arts	64	Academic Stress	51.22	16.370
		Self-efficacy	41.80	10.531
		Anxiety	39.89	9.892

Table I: Descriptive Statistics of different variables.

Descriptive statistics of Academic Stress, Self-efficacy and Anxiety for different independent variables is listed in table I. There are five sets of dichotomous variables with frequencies and mean and standard deviation of three dependent variables Academic Stress, Self-efficacy and Anxiety are listed.

Dichotomous variables	Dependent variables	Levene Statistic	df1	df2	Sig.
Boys vs. Girls	AS	2.639	1	228	.106
	Self-efficacy	.354	1	228	.553
	Anxiety	.001	1	228	.977
XI vs. XII	AS	5.488	1	228	**.020**
	Self-efficacy	2.785	1	228	.097
	Anxiety	4.577	1	228	**.033**
Joint vs. Nuclear	AS	.412	1	228	.522
	Self-efficacy	3.743	1	228	.054
	Anxiety	5.439	1	228	**.021**
Science vs. Arts	AS	.942	1	228	.333
	Self-efficacy	1.128	1	228	.289
	Anxiety	.734	1	228	.392
Urban vs. Rural	AS	1.343	1	228	.248
	Self-efficacy	.246	1	228	.620
	Anxiety	5.135	1	228	**.024**

Table-II: Test of homogeneity of variance

Table II represents the test of homogeneity of variance between dichotomous variables Boys vs Girls, class XI vs class XII, Joint vs. Nuclear family, stream Science vs. stream Arts and Urban vs Rural for Academic Stress, Self-efficacy and Anxiety. It is found that for majority of the cases variances are

homogeneous (sig. >.05). There are four cases where variances are non-homogeneous (AS between XI vs XII, Anxiety between XI vs XII, Anxiety between Joint vs. Nuclear and Anxiety between Urban vs. Rural).

Boys		Shapiro-Wilk Test of Normality		
		Statistic	df.	Sig.
	Academic Stress	.988	146	.220
	Self-efficacy	.989	146	.312
	anxiety	.994	146	.806
Girls	Academic Stress	.981	84	.237
	Self-efficacy	.994	84	.956
	anxiety	.984	84	.381
Class-XI	Academic Stress	.987	164	.145
	Self-efficacy	.992	164	.502
	anxiety	.990	164	.338
Class-XII	Academic Stress	.976	66	.225
	Self-efficacy	.982	66	.432
	anxiety	.965	66	.059
Joint Family	Academic Stress	.990	136	.433
	Self-efficacy	.995	136	.944
	anxiety	.993	136	.764
Nuclear Family	Academic Stress	.982	94	.239
	Self-efficacy	.982	94	.220
	anxiety	.969	94	**.025**

Location Urban	Academic Stress	.982	146	.054
	Self-efficacy	.990	146	.430
	anxiety	.987	146	.174
Location Rural	Academic Stress	.982	84	.273
	Self-efficacy	.989	84	.704
	anxiety	.992	84	.879
Stream science	Academic Stress	.988	166	.168
	Self-efficacy	.989	166	.200
	anxiety	.992	166	.544
Stream Arts	Academic Stress	.969	64	.114
	Self-efficacy	.981	64	.408
	anxiety	.991	64	.911

Table-III: Test of Normality

Table III represents the test of normality for different distribution of dependent variables Academic Stress, Self-efficacy and Anxiety for five pair of independent variables. All the distribution except Anxiety of nuclear family are approximately normally distributed (Sig. >.05) by Shapiro-Wilk Test of Normality.

	Variables	Assumption on variance	t	df	Sig. (2-tailed)	Hypothesis
Sex: Boys Vs. Girls	Academic Stress	Equal variances assumed	-.131	228	.896	Null hypothesis accepted
	Self-efficacy	Equal variances assumed	-.433	228	.666	Null hypothesis accepted
	Anxiety	Equal variances assumed	-2.008	228	.046	Null hypothesis rejected
Family Type: Joint vs. Nuclear	Academic Stress	Equal variances assumed	3.333	228	.001	Null hypothesis rejected
	Self-efficacy	Equal variances assumed	.187	228	.852	Null hypothesis accepted
Class : XI vs. XII	Academic Stress	Equal variances not assumed	-2.487	101.786	.015	Null hypothesis rejected
	Self-efficacy	Equal variances assumed	1.466	228	.144	Null hypothesis accepted
	Anxiety	Equal variances not assumed	-1.545	148.751	.124	Null hypothesis accepted
Residence : Urban Vs. Rural	Academic Stress	Equal variances assumed	-1.810	228	.072	Null hypothesis accepted
	Self-efficacy	Equal variances assumed	-.445	228	.657	Null hypothesis accepted
	Anxiety	Equal variances not assumed	-.016	199.414	.987	Null hypothesis accepted
Streams: Science vs. Arts	Academic Stress	Equal variances assumed	.062	228	.951	Null hypothesis accepted
	Self-efficacy	Equal variances assumed	1.115	228	.266	Null hypothesis accepted
	Anxiety	Equal variances assumed	-2.406	228	.017	Null hypothesis rejected

Table- IV: Independent sample t-tests for different groups

The cases where equal variances are found between dichotomous independent variables for Academic Stress, Self-efficacy and Anxiety which are approximately normally distributed t-test is administered. For the cases where equal variances are not found we have administered t-test without assuming an equal variance.

Four such cases are found (Academic Stress between XI vs XII, Anxiety between XI vs XII, Anxiety between Joint vs. Nuclear and Anxiety between Urban vs. Rural).

Let us discuss pairwise independent variables:

Boys vs Girls:

➤ For academic stress and self-efficacy null hypotheses (H_{01} and H_{02}) accepted. So, there is no significant difference in academic stress and self-efficacy between boys and girls. But there is a significant difference between boys and girls in anxiety as null hypothesis (H_{03}) is rejected.

Residence: Urban Vs. Rural

➤ For all three cases null hypotheses (H_{04}, H_{05} and H_{06}) are accepted. So, there is no significant difference in academic stress, self-efficacy and anxiety between urban and rural students.

Streams: Science vs. Arts

➤ For academic stress and self-efficacy null hypotheses (H_{07} and H_{08}) are accepted. So, there is no significant difference in academic stress and self-efficacy between urban and rural students. But there is a significant difference between between urban and rural students in anxiety as null hypothesis (H_{09}) is rejected.

Class: XI vs. XII

➤ For academic stress null hypothesis (H_{010}) is rejected. There is a significant difference in academic stress between class XI and Class XII students. In cases of self-efficacy and anxiety null hypotheses (H_{011} and H_{012}) are accepted.

Family Type: Joint Vs. Nuclear

➤ For academic stress null hypothesis (H_{013}) is rejected. There is a significant difference in academic stress between Joint and Nuclear family students. For self-efficacy null hypotheses (H_{014}) is accepted.

Null Hypothesis	Test	Sig.	Decision
The distribution of anxiety is the same across categories of type of family.	Independent-Samples Mann-Whitney U Test	.106	Retain the null hypothesis.

Table V: Mann-Whitney U Test for anxiety between joint and nuclear type family.

The distribution of anxiety for the students who are from nuclear type families is not normally distributed. So comparison between joint vs nuclear type families for anxiety should be done by non-parametric method. Result of Mann-Whitney U Test for anxiety between joint and nuclear type families is shown in the table V. It represents that there is no significant difference between students belonging to joint and nuclear type families for anxiety.

Conclusion

For all cases there is no significant difference in self-efficacy. Self-efficacy in mathematics for higher secondary level students is statistically indifferent for the sex (boys and girls), the class (XI and XII), the family type (joint and Nuclear), the residence (urban and rural) and the stream (science and arts). Academic stress shows statistically significant difference for class (XI and XII), family type (joint and Nuclear). For all other cases there is no significant difference in Academic Stress. It is found that students who live in nuclear family experienced a more academic stress than the students who lived in joint family and the academic stress is more for class XII students than class XI students. Anxiety shows statistically significant difference for sex (boys and girls) and stream (science and arts) but indifferent for other cases. It is found that girls are more anxious than boys and Arts students are more anxious than science students.

Reference

Alam and Halder (2018). Academic Stress and Academic Performance among Higher Secondary Students: A Gender Analysis. International Journal of Creative Research Thoughts (IJCRT), Volume 6, Issue 1 March 2018.

Bedewy, D., & Gabriel, A. (2015). Examining perceptions of academic stress and its sources among university students: The Perception of Academic Stress Scale. *Health Psychology Open*, 2(2), 1 –9.

Cates, G. L., & Rhymer, K. N. (2003). Examining the relationship between mathematics anxiety and mathematics performance: An instructional hierarchy perspective. *Journal of Behavioral Education*, 12, 23–34.

 Deb, Sibnath, Esben, S. and Jiandong, S. (2014). Academic-related stress among private secondary school students in India. *Asian Education and Development Studies*, 3(2), 118-134.

Ghosh, S.M. (2016). Academic stress among government and private high school students. *The International Journal of Indian Psychology*, 3(2), 119-125.

Hodges, C. (2008). Self-efficacy, Motivational Email, and Achievement in an Asynchronous Math Course. Journal of Computers in Mathematics and Science Teaching, 27(3), 265-285.

Hughes, P. T. (2016). The relationship of mathematics anxiety, mathematical beliefs, and instructional practices of elementary school teachers (Doctoral dissertation). Georgia State University, Atlanta.

Izzati, I. D. C., Tentama, F. & Suyono, H. (2020). Academic Stress Scale: A Psychometric Study for Academic Stress in Senior High School. *European Journal of Education Studies*, 7(7), 153-168.

Kadapatti & Vijayalaxmi, (2012). Stressors of academic stress--a study on pre-university students. *Indian Journal of Scientific Research*, 3(1), 171-175.

Kargar, M., Ahmad Tarmizi, R. and Bayat, S. (2010). Relationship between Mathematical Thinking, Mathematics Anxiety and Mathematics Attitudes among University Students. *Procedia Social and Behavioral Sciences* 8, 537–542.

Karimi, A. and Venkatesen, S. (2009). Mathematics anxiety, mathematics performance and academic hardiness in high school students. *International Journal of Education and Science*, 1, 33-37.

Khan, M. J. and Altaf, S. Kausar,H.(2013). Effect of Perceived Academic Stress on Students' Performance. *FWU Journal of Social Sciences*, 7(2), 146-151.

Kundu, A. and Ghose, A. (2016). The Relationship between Attitude and Self Efficacy in Mathematics among Higher Secondary Students. *IOSR Journal of Humanities and Social Science*. 21(4), 25-31.

Lee, M., & Larson, R. (2000). The Korean 'examination hell': Long hours of studying, distress, and depression. *Journal of Youth and Adolescence*, 29(2), 249-271.

Ma, X., & Xu, J. (2003). The casual ordering of mathematics anxiety and mathematic achievement a longitudinal panel analysis. *Journal of Adolescence*, 27(2), 165-179.

Mark H. Ashcraft, Alex M. Moore (2009). Mathematics Anxiety and the Affective Drop in Performance. *Journal of Psychoeducational Assessment*, April 13, 2009.

May, D. K. (2009). Mathematics Self-Efficacy and Anxiety Questionnaire. Retrieved on from
https://getd.libs.uga.edu/pdfs/may_diana_k_200908_phd.pdf

Misra, R & Castillo, L. G. (2004). Academic Stress among College Students: Comparison of American and International Students. International Journal of Stress Management, 11(2), 132–148.

Nadamuri & Ch (2011). Sources of Academic Stress – A Study on Management Students. *Journal of Management and Science*, 1(2), 2011, 31- 42.

Puteh M. and Khalin S. Z.(2016). Mathematics Anxiety and Its Relationship with the Achievement of Secondary Students in Malaysia. *International Journal of Social Science and Humanity*, Vol. 6, No. 2, February, 2016.

Putwain, D. W. (2007). Test anxiety in UK schoolchildren: Prevalence and demographic patterns. *British Journal of Educational Psychology*, 77, pp. 579-593.

Venkatesh, K. G. and Karimi, A. (2010). Mathematics Anxiety, Mathematics Performance and Overall Academic Performance in High School Students. *Journal of the Indian Academy of Applied Psychology*, 36(1), 147-150.

Viqar, A. (2012). Acomparative Study of Academic Stress Emotional Stability and Parental Attitude Among Students Manifesting Obedient and Disobedient Tendencies. Ph. D. Thesis
http://shodhganga.inflibnet.ac.in:8080/jspui/handle/10603/62755

Yadav, S. & Singh, P.N. (2018). A Study on Mathematics Anxiety and Mathematics Achievement of Secondary School Students. International Journal of Social Sciences Arts and Humanities Vol. 5 No. 3. 2018. Pp. 52-57.