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Mathematics anxiety in undergraduate students of Bangladesh

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Abstract

The purpose of this study was to determine mathematics anxiety levels of undergraduate students' in Bangladesh. This study used survey to collect data from the students of two universities. The study involved 207 respondents (119 male and 88 female). The respondents were selected both purposively and conveniently. The instrument used to measure mathematics anxiety levels was adopted from Paul Mutodi and Hlanganipai Ngirande (2014). Statistical Package for the Social Sciences (SPSS), version 20.0 was used to analyze the data. The study found that there were low, moderate and high mathematics anxiety levels among the respondents. The results also revealed that mathematics anxiety level of female students were higher than male mathematically but the gender effect was not significant. Mathematics anxiety of the students of public university was significantly higher than private university students. The students who had not taken science group at HSC were more anxious.

Keywords: Mathematics anxiety, undergraduate students

1. Introduction

Bangladesh wants to reach upper middle-income country status by 2024. Accordingly we need to improve the quality of our education. Higher education theoretically enables individuals to expand their knowledge and skills and finally improves an individual's quality of life (Allen Heather, 2007) ^[1]. A great portion of education is related with mathematics. Mathematics can be considered as a gatekeeper for better employment (Guney Hacımeroglu, 2014) ^[2]. Mathematical thinking is needed for national prosperity by understanding science, engineering technology, Economics, any work place, personal decision making, public decision making and to participate in the knowledge based economy (Ruchi Srivastava, Ali Imam and Gyan Pratap Singh, 2016) ^[9]. According to the report (2010) of the committee formed to upgrade the standard of mathematics education in the secondary level of Bangladesh, suggested that today's world is the world of science and technology and to keep pace with the present world we have to build up our expertise in mathematics. But the world economic forum (2013) reported that the standard of mathematics education of Bangladesh is 113th out of 144 countries. Researchers have shown that economic progress is closely related to math performance of the learners whose age level is 15 or more and who have passed from schools (Editorial column, The Daily Ittefaq, 27.02.15). It has always been mathematics that plays an important role in developing scientific knowledge and technological advancement. The final report of the National Mathematics Advisory Panel, U.S. Department of Education, (NMAP, 2008) ^[8] cited as Kara L. Reed (2014) emphasizes that improvement of mathematics education are needed for the safety of a nation and quality of life and even the prosperity of a nation.

Mahmood, Sadia and Khatoun, Tahira (2011) ^[7] stated that "math anxiety often leads to avoidance of math by those who experience it" (p 170). They also cleared that students who are math anxious most likely avoid the study of math and they avoid math courses, finally math anxiety greatly impacts math education and students career choice. Math anxiety has an effect on teachers and students and it has an obstacle for math achievement (The final report of the National Mathematics Advisory Panel. U.S. Department of Education (NMAP, 2008) ^[8], cited as Kara L. Reed, 2014) ^[5]. Hambree (1990) reported that as impact of math anxiety students avoid mathematics and finally, their career options are reduced, eroding the countries resource based on science and technology. Mathematics anxiety has been an

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important and also a common problem in learning and teaching from elementary through university levels for the last three decades (Uusimaki & Nason, 2004; Vinson, 2001 ; Guney Haciomeroglu, 2014) ^[12, 13, 2]. Mathematics anxiety is a reality for many students. When students suffer from mathematics anxiety, their willingness to enroll and succeed in mathematics courses also gets hampered (Stubblefield, 2006) ^[10].

The meaning of anxiety is fear or nervousness about what might happen (Merriam Webster Learner's Dictionary). On the other hand according to the Oxford Dictionary, anxiety is a feeling of worry, nervousness or uneasy about something with an uncertain outcome. Richardson and Suinn (1972) cited by McAnallen (2010) ^[6] defined mathematics anxiety as — “feeling of tension and anxiety that interfere with the manipulation of mathematical problems in a wide variety of ordinary life and academic situations (p. 544)” and also they stated that mathematics anxiety may include dislike of mathematics, worry, and fear with specific behavioral manifestations that include tension, frustration, distress, helplessness, and mental disorganization. Fennema and Sherman (1976) cited by McAnallen (2010) ^[6] also believe that mathematics-related distress is accompanied by symptoms, including dread, nervousness, and an increased heart rate.

Mahmood, Sadia and Khatoun, Tahira (2011) ^[7], mentioned that Dreger and Aiken introduced math anxiety in 1957 as a new term to describe student's attitudinal difficulties with math. Richardson and Suinn developed the first comprehensive scale specifically to measure math anxiety in 1972 and then validated it first with adults consisting of a total of 98 items then all other researcher introduced different scale with different dimension. Hembree, (1990) ^[4] mentioned that in the early 1970s, mathematics anxiety was selected as an area of research in North American society and also it affects both teachers and students. Over the last decade researchers are trying to understand when and how math anxiety develops (as cited in Ganley CM and McGraw AL, 2016) ^[3]. Those who are undergraduate student at present, one day they will be scientist, mathematician, engineer, doctor, and technologist even math teacher. So we need to reduce math anxiety and improve the quality of math education. Therefore it is needed to analyze the present situation of math anxiety.

2. Purpose

The main objective of this study was to investigate the status of mathematics anxiety among undergraduate students. To achieve the objective the following research questions were generated.

3. Research question

1. What are the levels of mathematics anxiety among the undergraduate students?
2. What is the effect of gender on mathematics anxiety of students'?
3. What is the difference of mean of mathematics anxiety score between the students of private and public university?

4. What is the effect of students group at HSC level on mathematics anxiety score?

4. Methodology

Totally 207 (119 male and 88 female) undergraduate students were selected as sample. One public university (99) and one private university (108) were selected conveniently from all universities of Bangladesh. The minimum age of the respondents was 18 and maximum age was 25 but most of the students (58%) age were within 20. Totally 102 students were in science department and 105 students were non science. 163 students were science with higher math and 44 were without higher math at SSC level. Again 158 students were science with higher math and 49 were without higher math at HSC level. A 10 item math anxiety questionnaire with 5 point likert scale of Paul Mutodi and Hlanganipai Ngirande (2014) ^[9] adopted from Jerran's Maths Centre (2012) was used as instrument to measure mathematics anxiety level. Twelve demographic questions were included such as gender, age, name of the University, group at HSC level etc. with original 10 items. All items were positively worded. No controversial question was used. The languages of the demographic questions were checked properly. At first the purpose of the researcher was described to the students and the verbal consents were taken from the chairperson of the related department. The participants have got full freedom of offering or not giving their opinions or withdrawing their given opinions. The respondents have got the opportunity of using nick name in place of own names. Researcher himself collected data from the teachers in most of the cases. So, it was possible to minimize any confusion. All the collected questionnaires were coded before analysis. Descriptive statistics were carried out for various categorical variables to get frequencies and percentages. Data were analyzed using computer program, Statistical Package for Social Sciences (SPSS). The results of data analysis were presented in form of tables, graphs. Participants whose scores were at least one standard deviation below the overall mean were categorized as possessing low mathematics anxiety level, while those with scores that were at least one standard deviation above the overall mean were considered as having high mathematics anxiety level. Moderate mathematics anxiety level was assigned to participants whose scores were not up to one standard deviation below or above the overall mean. Analysis of variance (ANOVA) was performed to compare the different level of math anxiety score. T-test was performed to compare anxiety scores for different category. Different ethical issues were considered to collect and analyze the data.

5. Results and Discussion

5.1 Mathematics anxiety level: In order to find the levels of mathematics anxiety of the participants were calculated by adding their responses to each item on the survey for 207 undergraduate students. The lowest score obtained was 10 and the highest was 44 out of the possible 50. The mean scores of mean, median and mode were 25.24, 25 and 26 respectively.

Table 1: Information about math anxiety score

Items	Scores
Mean	25.24
Std. Error of Mean	.477
Median	25.00
Mode	26
Std. Deviation	6.861
Variance	47.068
Skewness	.017
Std. Error of Skewness	.169
Kurtosis	-.069
Std. Error of Kurtosis	.337
Range	34
Minimum	10
Maximum	44

Figure shows that the distribution was very close to normal.

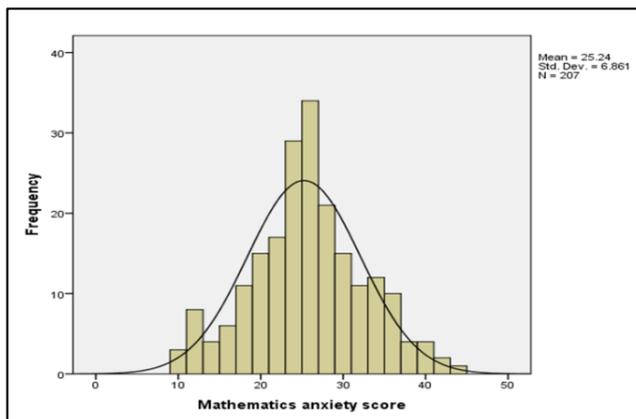


Fig 1: Distribution of the variable Math anxiety score

Therefore the overall means and standard deviations of their scores were used to assign them into anxiety groups as low, moderate, high. Participants whose scores were at least one standard deviation below the overall mean were categorized as possessing low mathematics anxiety level, while those with scores that were at least one standard deviation above the overall mean were considered as having high mathematics anxiety level. Moderate mathematics anxiety

level was assigned to participants whose scores were not up to one standard deviation below or above the overall mean. The results indicated that 32 (15.5%) of the 207 participants experienced low level of mathematics anxiety, 142 (68.6%) experienced moderate level, and 33(15.9%) experienced high level of mathematics anxiety.

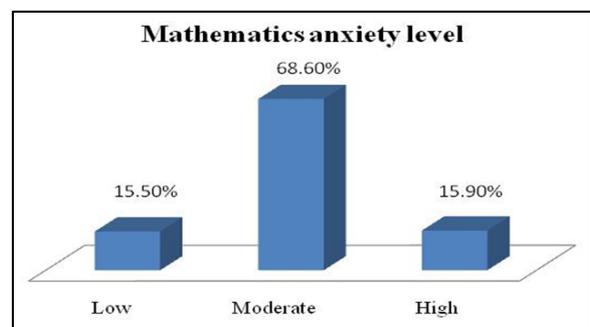


Fig 2: Math anxiety level of the respondents

One way ANOVA was performed to compare (mean) the difference between groups of math anxiety level (Low, Moderate and High). Here $P < .01$, so, the math anxiety levels were differed and statistically significant at 99% confidence level. Table 4.10(a) and 4.10(b) shows the means and ANOVA (Analysis of variance) respectively.

Table 2(a): Means for MA level (Low, Moderate, High)

Math anxiety level	N (207)	Mean (Math anxiety score)	Std. Deviation	Std. Error
Low	32 (15.5%)	14.38	32	2.780
Moderate	142 (68.60%)	25.20	142	3.405
High	33 (15.9%)	35.94	33	2.882

Table 2(b): One way ANOVA for MA score

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	7555.466	2	3777.733	360.044	.000
Within Groups	2140.456	204	10.492		
Total	9695.923	206			

5.2 Mathematics anxiety and students' gender: The participants of the study were 207 under-graduate students where 119 (57.49%) of them were males and 88 (42.51%) were females. The average math anxiety score for males was 24.67 and math anxiety score for females was 26.01.

Leven's test was not significant so variances were assumed equal therefore the difference between the mean anxiety score was not significant at 95% confidence level. So the math anxiety score for females was higher than males but the difference was not significant.

Table 3(a): Means for mathematics anxiety level (Male and Female)

Gender	N (207)	Mean (Math anxiety score)	Std. Deviation	Std. Error
Male	119 (57.49%)	24.67	6.726	.617
Female	88 (42.51%)	26.01	7.003	.747

Table 3(b): T- test for equality of means for male and female

Levene's test for equality of variances			t-test for equality of means for male and female						
	F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% confidence interval of the difference	
								Lower	Upper
Equal variances assumed	.079	.779	-1.39	205	.166	-1.339	.962	-3.23	.55
Equal variances not assumed			-1.38	183.28	.168	-1.339	.968	-3.24	.57

5.3 Mathematics anxiety between private and public university students: Out of 207 students 108 (52.17%) were selected from Daffodil University and 99 (47.83%) were selected from Jahangirnagar University. The average math anxiety score for Daffodil University student was 24.19 and math anxiety score for Jahangirnagar University student was 26.38. Here leven's test was significant so

variances were assumed not equal therefore the difference between the mean anxiety score of two university students was significant at 95% confidence level. So the math anxiety score for public university students was higher than private university students and which was statistically significant.

Table 4(a): Means for mathematics anxiety level for different university

Name of university	N (207)	Mean (Math anxiety score)	Std. Deviation	Std. Error
Daffodil University	108 (52.17%)	24.19	8.159	.785
Jahangirnagar University	99 (47.83%)	26.38	4.871	.490

Table 4(b): T- test for Equality of Means for different university

Levene's test for equality of variances			T-test for equality of means for different university						
	F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% confidence interval of the difference	
								Lower	Upper
Equal variances assumed	28.13	.00	-2.31	205	.02	-2.189	.945	-4.05	-.32
Equal variances not assumed			-2.36	177.14	.01	-2.189	.925	-4.01	-.36

5.4 Mathematics anxiety and students group (Science or Others): Out of 207 students 158 (76.33%) were selected from science background at HSC level and 49 (23.67%) were selected from other group at HSC level. The average math anxiety score for science background students was 23.82 and math anxiety score for non science background students was 29.84. Here leven's test was not significant so

variances were assumed equal therefore the difference between the mean anxiety score of two categories was significant at 95% confidence level. So the math anxiety score for non science background students was higher than science background students and which was statistically significant.

Table 5(a): Means for mathematics anxiety level having science or not at HSC level

Having science at HSC level	N (207)	Mean (Math anxiety score)	Std. Deviation	Std. Error
yes	158(76.33%)	23.82	6.498	.517
no	49(23.67%)	29.84	5.970	.853

Table 5(b): T- test for Equality of Means having science or not at HSC level

Levene's test for equality of variances			T-test for equality of means having science or not at HSC level						
	F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% confidence interval of the difference	
								Lower	Upper
Equal variances assumed	.164	.68	-5.77	205	.00	-6.020	1.043	-8.07	-3.96
Equal variances not assumed			-6.03	86.198	.00	-6.020	.997	-8.00	-4.03

6. Conclusion

It can be concluded that undergraduate students in Bangladesh are not free from math anxiety. Students those who had science background their anxiety were significantly higher than others. This message will encourage our students to take science group at secondary and higher secondary level. Based on the findings math anxiety of female students was higher than male students mathematically but the difference was not significant. Therefore female students will be confident to take

mathematics. On the other hand the students of private university were not backward according to level of math anxiety. Now we need to emphasis how we can reduce math anxiety from our students. Math anxious student always perform poorly in mathematics. They lose their confidence and afraid to face competition in job market even fail to success in their professional carrier. If we cannot reduce math anxiety our science education will weak in base. Without scientific development no nation can prosper in this competitive global world.

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