

Original Article: A Study on Math Anxiety and Gender Difference in Sherubtse College (Royal University of Bhutan)

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ABSTRACT

Objective: The main objective of this study is to know and understand the mind of every individual regarding gender difference and math anxiety influence on boys' and girls' performance in mathematics because many researchers have found out that there is no clear distinction on it.

Method: 60 students were randomly chosen from a total of 1531 students in Sherubtse College to be the respondents in this study and enrolled in spring 2021. There were 32 males and 28 females among the 60 respondents. The quantitative method was used for this study as the data were reliable and generalized to a larger population. In addition, the stratified random sampling was used and the participants randomly from the first, the second, and the third-year base on their gender were selected. Firstly, the descriptive statistical test was conducted using SPSS software to examine the significant differences between independent variable that is gender and other dependent variables such as Indicators of Math Anxiety (IMA-Total) based on Parkinson's Four Factors of Emotion Theory, Math Anxiety Questionnaire for Adults (MAQA-Total), and Mathematics Anxiety Rating Scale (MARS-Total) to observe gender differences regarding math anxiety amongst male and female students in the college.

Findings: The statistical t-test determined that whether there was a significant difference in level of math anxiety between the two different groups such as male and female in general. The descriptive statistics indicates that there is no significant difference in math anxiety between male and female students however, there is a slight difference between gender and math anxiety in the college.

Conclusion: The results of this study showed that there is no significant difference regarding math anxiety between male and female students of the Sherubtse College. Therefore, it can be mentioned that linking mathematics as a male dominance is incorrect and it is a stereotype because no such substantial difference was found in the study to reject the null hypothesis.

Introduction

The subject of math in Bhutan has long been impacted by the Indian curriculum, which emphasizes rules and rote learning, and has caused anxiety and poor performance in both

boys and girls [1].

Furthermore, as reported by Kuensel [2], mathematics has always been a challenge to those students who are struggling to accomplish academic performance in Bhutan. Moreover, in a survey by Bhutan Council for School Examinations and Assessment (BCSEA) and Royal Education Council (REC) have reported that students have achieved marginally better in reading and science compared to mathematics. It also showed that due to low level of self-confident and anxiety, decreased boys' and girls' achievement in mathematics [3].

Likewise, one of the probable clarifications to Bhutanese students' poor math performance is because of math anxiety irrespective of their gender. In addition, there are no works of literature studying on gender and math anxiety of boys and girls in Bhutan. It is therefore necessary to study the gender and math anxiety to understand why majority of researchers have shown that math has unswervingly and gendered as a male domain due to female getting more math anxiety than male [4-6].

The possible of unclear math anxiety and gender difference finding related to influence and impact on boys' and girls' academic achievement in mathematics in the schools and college has been studied in various published literatures.

Firstly, the reasons for the math anxiety amongst boys' and girls' affects the performance and attitude towards mathematics depending on multiple variables such as gender, teacher, and stereotype [7].

Similarly, anxiety related to mathematics has been linked to a variety of adverse outcomes, including decreased mathematics performance and an unfavorable outlook toward mathematics [8].

Furthermore, previous research has found that math-anxious teachers model a fear of mathematics, with girls' students in classrooms with math-anxious female teachers more likely to model themselves after their teachers and endorse the traditional gender stereotype that girls are bad at math [9].

Moreover, the stereotype threat is consistent with math anxiety, influencing girls' and boys' performance in mathematics in a range from

social influences [10]. Furthermore, a long-standing gender stereotype is that women and girls do poorly in math than men and boys [11].

In addition, many studies [12] explored the critical elements that govern math anxiety, and one common aspect shown to have a significant impact was personal factors such as cognitive, motivational, emotive, and selective processes when acquiring mathematical knowledge [13].

Further, student's parents are a direct source of both vicarious experience and verbal persuasion. Parental behavior, attitudes, and encouragement could either support or hinder a child's involvement in, like, and feelings about math [13].

Nevertheless, there is no empirical evidences and findings in the literature about the assessment of the level of math anxiety felt by boys and girls in the schools and colleges. While, to our knowledge, there is an absence of clarity on how math anxiety affects boys and girl performance in the mathematics, one can draw conclusions about this relationship but the goal of importance connection between a math anxiety and academic performance has not been reached on the grounds [14].

Although, even in Bhutan some studies were conducted to know about math anxiety and gender difference towards their performance and sense of an adverse attitude for mathematics only within primary schools, but not at college level. As a result, it is critical to understand the extent of math anxiety among college students.

Many studies have reported positive as well as negative relationships between boys' and girls' math anxiety and academic performance [15]. Nonetheless, there is no clear distinction between boys and girls when it comes to math anxiety and performance. The study on this topic is truly substantial for educational institutions, academicians, and scholars for understanding and exploring gender difference and the growth of math anxiety regardless of boys and girl's performance and attitude which influence their academic achievement in mathematics.

In general, this study highlights several advantages in the execution of the new curriculum such as gender base course to diminish the stereotypes regarding gender and

mathematics as the nation is working on the steps of the new curriculum. The study will be asset to teachers and students but also intended to develop their understanding and confidence in the effective implications of teaching mathematics, which will lead to further improvement of the mathematics curriculum by adopting new measures in the syllabus. The research on students shows that various elements and their interactions all contribute to the development and appearance of maths anxiety.

Eventually, this article will be used to aid in understanding gender differences and bridging the stereotyped gender gap in academic accomplishment preference for males. Based on Parkinson's Four Factor Theory (Parkinson, 1995), the purpose of this study is to determine the elements that signal students' maths fear. As a result, the entire study will be conducted among college students to primarily investigate gender differences and math anxiety in educational institutions.

The main objective of this study is to know and understand the mind of every individual regarding gender difference and math anxiety influence on boys' and girls' performance in mathematics because many researchers have found out that there is no clear distinction on it.

In addition, to understand this issue, the stratified random sampling was and the participants randomly from the first, the second, and the third-year base on their gender were selected. After stratifying the participants, I will conduct sample random sampling consist of 30 males and 30 females. The data will be collected via the distribution of questionnaires using the Google Forms and will be analysed using Social Sciences Statistical Package (SPSS).

The data analysis will be done through T-test. Lastly, it is important to carry out study in the sense of Bhutanese so that the results can be associated with the published literature in other countries to draw a common conclusion.

Literature Review

Beginning with a review of the research on the topic of math anxiety, this section goes into the many forms of math anxiety as well as some of the contributing causes.

In addition, the literature on gender differences in math anxiety is reviewed together with several other factors in this study, and their connections are looked at. To get a deeper knowledge of the associated relationship, historical research, and observations will be further discussed from theoretical angles.

To determine the ranges and relationships between variables, the independent and dependent variables of the study are analyzed. The section ends with a suggested study design and hypothesis.

Math Anxiety

Math anxiety arises from a much bigger, blurred, and mysterious anxiety paradigm.

In addition, many researchers and scholars are still investigating possible connections between math and anxiety.

Regrettably, when it comes to math, many students become nervous and worried. People who experience discomfort when questioned with math-related cases could be starting to suffer from 'math anxiety.'

According to Dukpa (2014) [16], many Bhutanese who have first-hand experience studying mathematics in Bhutanese classrooms continue to believe that the subject is either dull or difficult. Arithmetic anxiety might be one of the factors for the children' low mathematics performance. Math anxiety is defined as a sensation of stress and worry that interferes with numerical manipulation and problem solving in a wide range of everyday and academic contexts [8].

However, according to Betz (1978), math anxiety can significantly pressure students, particularly those with low math self-confidence and interfere with their learning. The main aspect regarding whether there are diverse kinds of math anxiety has significant consequences for determining math anxiety. Math anxiety manifest in different form such as Problem-Solving Anxiety, Mathematics Test Anxiety, Everyday Numerical Anxiety, Passive Observation Anxiety, and Performance Anxiety (Bessant, 1995).

In addition, a number of motivating and significant questions arise out of many attempts to measure math anxiety in my mind. Nevertheless, many researchers conclude that the Mathematics Anxiety Rating Scale [17] have analyzes level of math anxiety.

Personal Factor

There is a common link between personal factors and math anxiety. There are many personal factors but the most regularly studied is in relation to math attitudes and performance is self-efficacy [13].

Self-efficacy refers to an individual's confidence in his/or her abilities to perform actions that are required to deliver clear quality achievements in their academic. The idea that higher levels of self-efficacy in mathematics are correlated with greater persistence, higher performance levels, and more interest in math but lower level of mathematics allied with minor levels of mathematical achievement and behaviors in the students Chamberlin (2010) [37].

Similarly, a few studies have found out that boys and girls in the school has demonstrates the results of self-efficacy as a tool in student's math anxiety and their performance [18].

However, very few studies specifically studied the relationships between math self-efficacy and math anxiety. Among the few who have, Jameson (2014) reported a negative correlation between self-efficacy and math anxiety [13].

Similarly, Cooper and Robinson (1991) [19] observed that students with a high degree of math self-efficacy seemed to have a low level of math anxiety. Furthermore, the students who intended to perform better in mathematics during the academic year, and therefore had a high degree of self-efficacy, had lower math anxieties the next year [11]. Thus, the degree of self-efficacy in mathematics is a useful indicator of math performance in schools and college students.

Nevertheless, self- efficacy is also link towards math anxiety amongst boys and girls in the schools and colleges generating a concept of gender difference towards mathematics.

In addition, Ozyurek (2005) [20] claimed that self-concept regarding math anxiety is believed

to be the important indicator to see gender difference in the field of mathematics in the schools and colleges with a notion of male domination. Hence, math anxiety operates in a cyclical connection with self-concept which creates the level of gendered in terms of boys and girls regarding mathematics.

Parental Influence

The parental influence is one of the important aspects for math anxiety while affecting girls and boy's performance towards mathematics. For instance, Jameson (2014) [13] observed that parental behaviors, beliefs, and support can be either assisted or discouraged students' performance towards math preventing students' interest and thoughts towards math.

In addition, Simpkins, Davis-Kean, and Eccles (2005) [21] mentioned that parental involvement, parent-child co-activity, and the availability of interaction materials were strongly related to their student's involvement in learning mathematics.

Furthermore, it was found that parents of boys seem to be more likely than parents of girls to claim that mathematics is more important than other subjects for their sons and daughters. Likewise, it was observed that more potential was assigned to sons than to daughters by parents of boys and girls who were good in mathematics [22].

In addition, parents do not want their daughters to achieve as much as their sons in mathematics, which will affect the performance as well as attitude of a girl for mathematics leading to math anxiety [23].

However, evidences are mixed with respect to the gender difference by parents' attitudes towards their children and their mathematics performance affecting the level of math anxiety [24].

Teacher Behaviors

Years of research have helped us get a solid knowledge of the impact of math anxiety on kids, but we're only just beginning to comprehend the effects of arithmetic anxiety on instructors.

Hembree (1990) further remarked that one would anticipate instructors, who are tasked with serving as students' math tutors, to have a very positive attitude towards math. Unfortunately, compared to people in other academic fields like business, physical science, and health sciences, elementary school teachers tend to be more anxious about mathematics [25].

Similarly, as cited by Swars, Daane, and Giesen (2006) [25], math anxiety of teachers has consequences that go beyond the individual, as teachers who report high levels of math anxiety generally report a drop-in confidence in their ability to effectively fulfil their teaching duties to their students. Furthermore, many studies have found a negative relationship between teacher math anxiety and student math performance [4]. In general, there is a link between a teacher's arithmetic anxiety and how they perceive their student's math performance.

Furthermore, we know that teachers in the school report high levels of math anxiety, which hinders children's learning.

However, it is unclear how the gender of the math teacher affects the math anxiety of boys and girls and their performance in math. According to Beilock (2008), young female students in math worried female professors' classrooms are more likely to identify themselves like their teachers and endorse the old gender stereotype that women are terrible at arithmetic [9].

Furthermore, Ramirez, Hooper, Kersting, Ferguson, and Yeager (2018) [26] reported that female students are likely to observe their female math teacher's insecurities and conclude that women are not expected to be good at math. In addition, one math anxious teacher reflected in one of Gresham's qualitative studies that "one day I was teaching a concept and literally cried in front of my students because I didn't get it either, I know that seeing their teacher get frustrated with the math left a long lasting if not lifelong impression on them." Nonetheless, it is unclear whether traditional gender stereotypes are causing math anxiety in teachers and determining how boys and girls perform in schools and colleges [38].

Gender and Math Anxiety

There is a modest gender difference in math performance, but it is difficult to identify a gender difference in math anxiety and attitudes. Many studies have found that women have higher levels of math anxiety than men, regardless of their ability to perform, according to Meece, Wigfield, and Eccles (1990) [11].

Similarly, the self-reported level of math anxiety among middle school females was about 20% greater than that of boys [27]. Therefore, a meta-analysis of gender and math anxieties determined that girls experience more math anxieties than boys on average in all surveys.

Nevertheless, since boys assume to do a brilliant well on math than girls by passing a math test, allows them the ability to maintain or strengthen existing math skills [27]. Added to that, Lubienski, Robinson, Crane, and Ganley (2013) discovered that while boys' and girls' math anxiety did not differ significantly at the start of school, a significant difference for boys is clear at the top of the achievement distribution by the end of high school, affecting boys and girls with different levels of math anxiety [12].

According to the majority of the literature on this topic, gender stereotyping is related to arithmetic performance, impacting both boys' and girls' levels of math anxiety. Gender is a woman's or man's socially formed sex identity. In the first case, stereotypes may be defined as broad generalizations shared by a group of people, with certain shared traits between men and women [28]. Furthermore, according to Good, Aronson, and Harder (2008) [28], the gender stereotype is consistent with mathematics, influencing both girls and boys in a variety of ways. This is why, when there is a gender stereotype, women do worse in math exams than males, but only when the math examination is at a specific degree of difficulty. The influence of gender stereotype is most disruptive to pupils' math performance.

For example, females have been reported to suffer more than boys under pressure, demonstrating girls' inadequacies, notably in mathematics, due to culturally established stereotypes about girls' low performance in

math [29]. Compared with females, guys break gender norms by maintaining their level of anxiety and performing well in mathematics.

A long-standing gender stereotype is that boys are good in math than girls, and math-related fields are male realms. In addition, Brown and Josephs given the fact that empiric evidence clearly does not endorse this perception, these assumptions are still held by individuals [24].

Furthermore, as cited by Robinson and Lubienski (2011) [30] from their meta-analysis of 100 reports of more than 3 million respondents found the gender gap in math to be minor, but in some fields of math but girls' performance better than boys in the schools and colleges. This meta-analysis reported that, through these findings, girl students show a positive result in programming, and boys did well in problem-solving.

Consequently, Meece, Wigfield and Eccles (1990) claimed that the size of influence of these gender differences was so small that there was no meaningful difference between boys and girls. More importantly, both girls and boys claimed in their research that boys were more likely than girls to favor mathematics in both schools and universities.

Furthermore, as cited by Arnot, David, and Weiner (1987), a negative attitude toward mathematics has been identified as one factor contributing to girls' lower participation and success in mathematics [31].

The most recent findings contributing towards performance in math amongst girls and boys is due to math anxiety as I already discuss above, but as its assistance the conversion of young girls away from mathematics rather than boys.

For example, [32], claims that the first international mathematics study conducted in 1964 and controlling for the level of instruction. It was found that boys outperformed girls in mathematics in most countries leading to more pessimistic mathematics attitudes for girls, but perhaps more liberal perceptions for boys. However, a study of recent papers on the math anxiety as it observed that it was determined by the behaviors and attitude of boys and girls in schools or colleges [29]. While some previous findings have reversed the pattern and the number of researchers has undeniably institute

that "mathematics is gendered as a male domain, both truthfully and at the moment" [5]. However, girls are prohibited from mathematical study in their early years.

Consequently, they abhorrence it in their high schooling and college. Therefore, they are going to drop in far lower numbers than boys as they go into higher grade. As a consequence, today we can see handful of women working in as accountants, engineer, and so on in the country.

In addition, these complex levels of math anxiety have not been followed by a comparable gender difference in math performance. The most consistent findings stating the math anxiety in relation to mathematics illustrate gender differences with regard to performance in mathematics. Nobody has, to our knowledge, discussed whether girls have a particular fear of mathematics. However, some results on math performance showed that boys were better able than girls to control their math anxiety [7].

Despite this, Robinson, and Lubienski (2011) [30] found that over the last 40 years, girls have slightly outperformed boys in mathematics grades. The observations of Brown and Kanyongo were also backed by these findings (2010) [22].

Therefore, a quantity of research has been steered concentrating on the implications of gender differences on the subject of mathematics are not yet convincing, since there are so many other variables leading to the achievement [4].

Theoretical Perspectives

In addition, according to Parkinson's Four Factor Theory of Emotions, it is presumed that there are gender differences in mathematics emotions because students hold varying degrees of belief in the usefulness and importance of mathematics, even when their performance is adjusted [25].

Likewise, the Four Factors of Emotion Theory (Parkinson, 1995), which is focused on variables of determining one's emotional experience, has a strong foundation in understanding the indicators of math anxiety experienced by students.

The most important factor of Parkinson's Four Factor Theory of Emotions is appraisal to the situation which can cause one's to experience positive or negative emotion. The second factor is arousal is divided in three forms such as physiological arousal, emotional arousal, and psychological arousal. The arousal factor in Parkinson's Theory of Emotion refers to physiological arousal caused by experiencing stimulation that causes body changes [17].

In addition, according to Laird (1974) states that expressive behaviors are easily identified, face expression is often used to distinguish the different forms of emotions experienced by an individual. The final factor of Parkinson's theory is action tendencies, which are linked to one's instant reaction to a circumstance (Rameli, 2016). Therefore, there is importance of emotion aspects as it determines one's adaption process show students' math anxiety based on the Parkinsons' Four Factor Theory.

Therefore, in literature review, there are some specific research articles about gender and math anxiety regarding boys' and girls' performance in mathematics. However, there is no clear distinction about these things, but it will further contribute ideas to existing literature.

Thus, this article will try to measure whether there is math anxiety between boys and girls affecting their performance in mathematics. In addition, this article will also try to verify whether there is a connection between genders of math anxiety grounded on the Parkinsons' Four Factor Theory in the college.

Hypothesis

H₁. There is no significant difference between gender and math anxiety.

H₂. There is no significant difference between Parkinson's' Four Factor Theory of Emotions and gender.

H₃. There are much more types of math anxiety among girls than boys.

Materials and methods

Participants

The potential participants for this study included all the students of Sherubtse College from the first, the second, the and third years because those students were beneficial and reliable source for my study. Similarly, they had better understand and knowledge on the math anxiety which was fully relevant to this study. Hence, it was easy for me to get information because I was not only familiar with the environment, but also the behavior of the students was observed regarding my study area. More importantly, there are distinct gender groups in the population, such as males and females. Hence, the results may also be largely generalized to the college's whole student body based on factors like gender, study area, and enrolment year.

Sampling

A sample size of 60 students was chosen using simple random sampling from the entire population.

Since every student at Sherubtse College has an equal chance of being chosen using this method, the results will be objective.

This technique was further utilized to ensure that each unit of the population had an equal opportunity to participate in the study, and it also had the benefit of allowing the results to be applicable to the whole population of students from which the sample was drawn [33].

Similarly, the sampling size was limited to only 60 participants because the size of the samples was kept relatively limited for case-oriented analysis [7]. Since, the sample size of 60 provided a reasonable starting point and the least sample error.

Here, a sampling frame was made with complete lists of students' names who were enrolled in the spring semester of 2021. There were a total of 1531 students in the campus, whereas 774 of them were males and 820 were females. This students' names were entered into an excel spreadsheet, and each student's name was given a number ranging from 1 to N. (such as 1, 2, 3, 4, 5,..., N students). Finally, I used Excel to generate a random number with a formula (=RANDBETWEEN) and 60 samples were taken.

As a result, data were gathered from these randomly selected participants in which 32 were males and 28 were females.

Materials

The data provided by the respondents was gathered using the structured questionnaires. For instance, the first three survey items were made to collect participant demographic data. It inquired about the respondent's gender, academic major, and enrollment year.

The gender issue is brought up since the main objective of this study is to look into how gender differs when it comes to arithmetic fear. To generalize the findings to college students with levels of math anxiety in their area of study between the first year, the second year, and the third year, the respondent's year of enrollment and their field of study were also asked.

Furthermore, the data about math anxiety in students were collected using modified version of the "Abbreviated Math Anxiety Scale" with "Math Anxiety Questionnaire for Adults (MAQA)" framed by Hopko, Mahadevan, Bare, and Hunt (2003) [35].

Likewise, it was normally used to measure student anxiety and it was one of the seminal instruments in the field [36]. The scale is a twelve-item self-report measure on which participants responded using a 4-point Likert scale ranging from 4 (Definitely Yes) to 1 (Definitely No) indicating how anxious they would feel during certain situations involving mathematics (e.g., "Indication of the prime number among the numbers 276, 277, 278, 279, and 280").

Nevertheless, Parkinson's Four Factors of Emotion Theory (Parkinson, 1995) was used to collect data regarding math anxiety, as it is based on indicators of determining one's emotional experience, provides a clear foundation in understanding and exploring different kind of math anxiety faced by male and female students.

The instrument used is self-developed math anxiety scale develop based on the Parkinson's Four Factor of Emotion Theory (Mohd Rustam, 2012). The scale is a sixteen-item self-report questionnaire consists of four constructs which

are Appraisal (4 items), Arousal (4 items), Face Expression (4 items), and Action Tendencies (4 items).

The participants were asked to give their agreement on each item based on the four-point scale on which participants responded using a 4-point Likert scale ranging from 4 (Strongly Agree) to 1 (Strongly Disagree) indicating their emotions involving mathematics (e.g., "My head feeling hurt to answer tough math questions").

In addition to support my research study, the Mathematics Anxiety Rating Scale (MARS) questionnaires framed by Beilock [9], was used to collect date and see the specific types of math anxiety such as problem-solving anxiety, mathematics test anxiety, performance anxiety, passive observation anxiety, and everyday numerical anxiety (Bessant, 1995), amongst students in the college. The respondents were asked to filled up the set of questionnaires using a 5-point Likert scale ranging from 1 (Never) to 5 (Always), (e.g., "Have you ever worry, listening to a person explain how your share of the expenses on a trip was figured out").

Hence, a well-structured questionnaire was designed using Google Forms and a link was provided to the participants through email whereas it consumed less time and further it helped in generating correct responses from the participant. Moreover, these questionnaires offer a convenient, affordable, and effective way to collect significant data from a large sample of individuals, as it can be easy to contact respondents both face-to-face and online [34].

Furthermore, other secondary data such as journals, articles, eBooks', etc. was collected to support my research study. And before circulating the survey questionnaire, the questionnaires were simply clarified to the respondents to ensure that they grasp the order of the questionnaire and its purposes via email and phone calls as per the participants' convenience.

Research Design

The quantitative method was used for this study as the data were reliable and generalized to a larger population. The data was gathered through Google Forms, using cross-sectional

research design as it was far more effective to conduct than other choices available for the study. It included self-completion survey questionnaires that were designed. The questionnaires were designed to assess the gender difference in math anxiety. The math anxiety in mathematics is the dependent variable and gender (male or female) is the independent variable for this study.

Data Analysis

The responses to each questionnaire by the respondents were collected and exported it into Microsoft Excel. After validating the data, Statistical Package of Social Sciences (SPSS) version 24.0 was used to analyzed descriptive statistics.

Finally, the obtained data are analyzed using the Independent t-test statistical test. In addition, descriptive statistics and t-test with $P < 0.05$ level of significance was used to analyze the data. The statistical t-test was used when the study sought to determine whether there was a significant difference in level of math anxiety between the two different groups such as male and female in general.

However, a self-developed math anxiety scale was also used in which it has been divided into four sub-scales based on Parkinson's Four Factors of Emotion Theory (Parkinson, 1995) such as appraisal, arousal, face expression and action tendencies, in which the test was conducted at two levels.

The first test was conducted for each of these sub-headings (appraisal, arousal, face expression, and action tendencies) independently to know whether the males and females differ significantly in these four areas of emotions toward math anxiety.

Secondly, the total scores of each of these sub-heading was recoded and made as "math anxiety-total" and another t-test was conducted to see the gender difference in math anxiety based on Parkinson's Four Factors of Emotion Theory (Parkinson, 1995).

The t-test was conducted in both the cases because the study was intended to see whether

there is difference in math anxiety between male and female genders.

In addition, to analyze questionnaires adopted from Mathematics Anxiety Rating Scale (MARS) framed by Beilock (2008), t- test was done to find the specific differences in the types of math anxiety among males and females in the college such as everyday numerical anxiety, passive observation anxiety, performance anxiety, mathematics test anxiety, and problem-solving anxiety [9].

Therefore, the statistical t-test was conducted for each of these sub-types of math anxiety (everyday numerical anxiety, passive observation anxiety, performance anxiety, mathematics test anxiety and problem-solving anxiety) independently to know whether the males and females differ significantly in these five areas of math anxiety.

Results

The gender is the nominal level of measurement (as male or female) since the respondents were selected randomly using simple random sample.

Similarly, the dependent variable (math anxiety) was measured at the interval level using a four-point Likert scale.

However, in the case of normality between genders, the A Shapiro-Wilk's test of normality was done to examine whether the data are approximately normally distributed. Likewise, given the sample size is larger than 30, we often assume that the measures derived from the sample will be normal.

Still, it is a good practice to test for normality assumption. For instance, according to Table 1, we assumed that level of math anxiety was found in both males and females whereas both p values are above 0.05 in which variables was normally distributed in the population and there is slightly equivalent level of math anxiety, but it does not differ significantly from normality between males and females in the college.

Table 1. Normality tests of

	N	Gender	Shapiro- Wilk		
			Statistic	df	Sig.
Total of Math Anxiety Questionnaire for Adults (MAQA-Total)	60	Male	0.97	32	0.52
		Female	0.98	28	0.90
Total of Indicators of Math Anxiety (IMA-Total) based on Parkinson's Four Factors of Emotion Theory	60	Male	0.95	32	0.15
		Female	0.95	28	0.20
Total of Mathematics Anxiety Rating Scale (MARS-Total)	60	Male	0.96	32	0.32
		Female	0.97	28	0.51

Note: N = Sample Size and df= degree of freedom.

In general, 60 students were randomly chosen from a total of 1531 students in the college to be the respondents in this study. There were 32 males and 28 females among the 60 respondents. Firstly, the statistical test known as descriptive statistics test was conducted in the Statistical Package for the Social Sciences (SPSS) software to examine the significant differences between independent variable that is gender and other dependent variables such Indicators of Math Anxiety (IMA-Total) based

on Parkinson's Four Factors of Emotion Theory, Math Anxiety Questionnaire for Adults (MAQA-Total) and Mathematics Anxiety Rating Scale (MARS-Total) to observe the gender differences regarding math anxiety amongst male and female students in the college.

The descriptive statistics indicates that there is no significant difference in math anxiety between male and female students however, there is a slight difference between gender and math anxiety in the college.

Table 2. Descriptive statistics about gender and math anxiety

	N	Mean	SD	Median	SEM	Min	Max	Skewedness	Kurtosis
Gender	60	1.47	0.50	1.00	0.06	1	2	0.13	-2.05
MAQA-TOTAL	60	31.89	8.27	32.50	1.06	13.00	48.00	0.25	0.40
IMA-TOTAL	60	41.29	13.69	38.50	1.76	15.00	71.00	0.26	0.71
MARS-TOTAL	60	34.91	10.42	36.00	1.34	16.00	60.00	0.08	0.47

H₁. There is no significant difference between gender and math anxiety.

In addition, to study the first hypothesis that is “there is no significant difference between gender and math anxiety”, the statistical test known as independent sample t-test was conducted in the Statistical Package for the

Social Sciences (SPSS) software to compare and observe the difference in math anxiety between male and female students in the college. The test indicated no significant difference in math anxiety between males (M = 32.47, SD = 9.02) and the females (M = 31.21, SD = 7.14), $t(58) = 0.583$, $p = 0.562$, 95% CI [-3.052 to 5.561].

Thus, the first hypothesis retained that is there is no significant difference between gender and math anxiety among male and female students in the college.

H₂. There is no significant difference between Parkinson's our Factor Emotions Theory of and gender.

Furthermore, independent sample t-test was conducted in the Statistical Package for the Social Sciences (SPSS) software to examine and observe the gender difference in math anxiety based on Parkinson's Four Factors of Emotion Theory. The test indicated no significant

difference between math anxiety between males ($M = 35.87, SD = 11.40$) and the females ($M = 33.82, SD = 9.26$), $t(58) = 0.75, p = 0.45$, 95% CI [-3.052 to 5.561].

Accordingly, no significant difference was observed in all Four Factors of Emotion Theory towards development of math anxiety between two genders (male and female students).

However, slight differences were found in the mean of these four such as appraisal, arousal, face expression, and action tendencies regarding their emotion towards mathematics, as presented in Table 3.

Table 3. Comparisons of indicators of math anxiety between male and female students

Indicators of Math Anxiety	Gender	Mean	Std. Deviation	Std. Error Mean
Appraisal	Male	8.56	3.16	0.55
	Female	7.28	2.41	0.45
Arousal	Male	8.87	3.19	0.56
	Female	8.17	2.29	0.43
Face expression	Male	9.43	3.14	0.55
	Female	9.35	3.14	0.59
Action tendencies	Male	9.00	3.15	0.55
	Female	9.00	2.89	0.54

The test also indicated that male students scored slightly higher on appraisal towards external stimulus whereas other three indicators have no difference in level of math anxiety based on Parkinson's Four Factors of Emotion Theory between the two genders, but there is a slight difference between two genders in general.

H₃. There are much more types of math anxiety among girls than boys.

Moreover, another test was conducted to see the different types of math anxiety such as

everyday numerical anxiety, passive observation anxiety, performance anxiety, mathematics test anxiety, and problem-solving anxiety among males and females' students in the college. The test indicated that there is no significant difference with the type of math anxiety among male and female students, but there is a slight difference between male and female students regarding the types of math anxiety they faced in their lives, as indicated in Table 4 in which there is chances of high level of math anxiety in females than of males' students in the college.

Table 4. Types of math anxiety between male and female students

Types of Math Anxiety	Gender	Mean	Std. Deviation	Std. Error Mean
Everyday Numerical Anxiety	Male	7.06	2.44	0.43
	Female	8.89	3.04	0.57
Passive Observation Anxiety	Male	7.00	2.63	0.46
	Female	8.39	2.79	0.52
Performance Anxiety	Male	7.43	2.55	0.45
	Female	9.03	3.44	0.65
Mathematics Test Anxiety	Male	8.06	2.93	0.51
	Female	10.00	3.48	0.65
Problem-Solving Anxiety	Male	7.43	3.32	0.58
	Female	9.85	3.69	0.69

Discussion

The result of this study showed that there is no significant difference between gender and the math anxiety among male and female students in the college because the statistical independent t-test reveals that the value of $p > 0.05$ ($p = 0.583$) is greater than 0.05. Thus, the first hypothesis of this study was retained in which there is no significant difference between gender and math anxiety among male and female students.

In addition, the second hypothesis was retained as there is no gender difference in math anxiety based on Parkinson's Four Factors of Emotion Theory in which both males and females have similarly level of emotions towards mathematics. Moreover, the result of this study showed that males and females students experiences math anxiety everyday indicating the situations and types of math anxiety they faced.

Furthermore, based on the results of this study, all four factors of Parkinson's Four Factor Theory serve as an index to classify one's

emotional experience towards math anxiety. In addition, the interpretation of Parkinson's Four Factors of Emotion Theory in this research provides a useful view of the factors in determining the presence of math anxiety in students.

Hence, for the four measured elements, the mean rank of test mean shows that, of the four measures of math anxiety, assessment towards face expression and action tendencies ranks the highest between both male and female college students. However, at the same times, the emotional experience is further affected by body reaction; face expression and action tendencies at a different level.

In general, there was no proper finding in the previous literature as whether there is a difference in math anxiety between genders. Likewise, some other findings suggest that there are variations in math anxiety between the genders, although others dispute this. However, my study found out that the female students have to some extent higher score regarding math anxiety whereas the male students have somewhat lower score regarding

math anxiety. Nevertheless, the difference in this study showed that the difference is not significant enough to reject the null hypothesis. Therefore, in general, there is no significant difference regarding math anxiety between male and female students in the college.

Appendix 1: Questionnaires

There are four set of questionnaires. Initially, you will have to provide your demographic information such as gender and course. The other three set of questionnaires are consisting of your mathematical understanding.

Part 1: Demographic Information

- 1.What is your gender?
- 2.In which year are you studying?
- 3.Your field of study?

Part 2: Math Anxiety Questionnaire for Adults (MAQA)

Instruction: In the following, there is a list of problems related to mathematics. Imagine that you are in a situation in which it is necessary to solve the following problems and determine if you are nervous in these situations by marking the answers as follows:

- 1- Definitely Not, 2- Generally Not, 3- Generally Yes, 4- Definitely Yes.

No.	Questionnaires	DN	GN	GY	DY
1	Calculation of the average level of fuel consumption of a car.	1	2	3	4
2	Calculation of how many square meters of bathroom tiles should be purchased.	1	2	3	4
3	The answer to the question of whether a prism can have 37 vertices.	1	2	3	4
4	Finding who is the tallest if Pema is taller than Sonam, Pema is shorter than Ngawang, Ngawang is taller than Sangay, and Sangay and Sonam are the same height.	1	2	3	4
5	The answer to the question, in how many ways can 6 people be seated at a table.	1	2	3	4
6	Calculation of 12% less than 215.	1	2	3	4
7	Calculation of the length of a route based on knowledge of the traveled time and average speed.	1	2	3	4
9	Calculation of average monthly earnings in the case of a 5% increase.	1	2	3	4
10	Indication of the prime number among the numbers 276, 277, 278, 279, and 280.	1	2	3	4
11	Dividing the number 10,179 by 13.5 without using a calculator.	1	2	3	4
12	Calculation of the sum $2396\frac{7}{9} + 6725$.	1	2	3	4

Part 3: Item Measure Analysis for the Indicators of Math Anxiety

There is no right and wrong answer to these questions but your response will help us to understand students' appraisal, arousal, action

tendencies, and also face expression throughout the process and situations in learning math.

No.	Indicators	Questionnaires	SA	A	D	SD
1	Appraisal towards External Stimulus	I feel worry when learn math concept that involve many symbols.	1	2	3	4
		Math teachers who like to ask questions to the students makes me feel worry.	1	2	3	4
		My previous moderate math achievement makes me worry to learn this subject.	1	2	3	4
		I feel worry when I lack of skills to learn math topic that involve a complex formula.	1	2	3	4
		I feel worry to miss the math lesson if I do not go to the class.	1	2	3	4
2	Arousal	My head feeling hurt to answer tough math questions.	1	2	3	4
		My heart beating fast when teacher asks me how good am I in certain math topic.	1	2	3	4
		I will day dream if I could not answer math examination questions.	1	2	3	4
		My palm sweating when answering math examination questions.	1	2	3	4
		My hands trembling before answering math examination questions.	1	2	2	4
3	Face Expression	I will frown my forehead when I could not answer math question asked by teacher.	1	2	3	4
		My face feeling hot when sitting for math examination.	1	2	3	4
		My face is easily sweating before math examination begin.	1	2	3	4
		I will snap-lip because I worry that I could not understand the math topic that has been taught by the teacher.	1	2	3	4
4	Action Tendencies	I will keep silent during mathematics class because I scared to be asked a math-related question.	1	2	3	4

	I will play with pen (others objects) when I could not answer math question during the examination.	1	2	3	4
	I will look at my other friends when could not answer a math questions given by the teacher.	1	2	3	4
	I always go to the toilet during math class to avoid from being ask a question.	1	2	3	4
	I will try to complete the math examination faster before other students done.	1	2	3	4

Part 4: Measuring types of Math Anxiety on Math Anxiety Rating Scale (MARS)

Instruction: In the following, there is a list of our daily activities related to mathematics. Imagine that you are in a situation in which it is

necessary to understand the following and determine how much you are able to deal with these situations by marking your option as follows: "Never", "Rarely", "Sometimes", "Often", or "Always". Remember that there is no right and wrong answer.

No.	Types	Questionnaires (Have you ever worried while...)	Never	Rarely	Sometimes	Often	Always
1	Everyday Numerical Anxiety	Listening to a person explain how your share of the expenses on a trip was figured out.	1	2	3	4	5
		Deciding how much change you should get back.	1	2	3	4	5
		Adding up a bill for a meal when you think you have been overcharged.	1	2	3	4	5
2	Passive Observation Anxiety	Sitting in a math class and waiting for the teacher to begin.	1	2	3	4	5
		Watching someone works with math tables and formulas.	1	2	3	4	5

		Watching someone works with a calculator.	1	2	3	4	5
3	Performance Anxiety	Having someone watch you as you add up a column of numbers.	1	2	3	4	5
		Having someone watch you as you divide a five-digit number by a two-digit number.	1	2	3	4	5
		Being asked to add up $976 + 777$ in your head.	1	2	3	4	5
4	Mathematics Test Anxiety	Thinking about an upcoming math test one hour before it begins.	1	2	3	4	5
		Thinking about an upcoming math test one day in advance.	1	2	3	4	5
		Waiting to get a math test returned on which you expect to do well.	1	2	3	4	5
5	Problem-Solving Anxiety	Doing a word problem in algebra.	1	2	3	4	5
		Solving a problem such as: If $x = 12$, and $y = 4$, what is the ratio of x to y ?	1	2	3	4	5
		Adding up $1/5 + 2/3$ in your head.	1	2	3	4	5

Appendix 2. SPSS Output

Table 5. Group statistics

Gender	N	Mean	Std. Deviation	Std. Error Mean

Math Anxiety Questionnaires for Adult	Male	32	32.4688	9.02679	1.59573
	Female	28	31.2143	7.41549	1.40139

Note: N= Sample Size.

Table 6. Independent samples test

Math Anxiety Questionnaires for Adult	Levene's Test for Equality of Variances		t-test for Equality of Means						
	F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
								Lower	Upper
Equal variances assumed	1.67	0.20	0.58	58	0.56	1.25	2.15	-3.05	5.56
Equal variances not assumed			0.59	57.79	0.55	1.25	2.12	-2.99	5.50

Table 7. Indicators of math anxiety between male and female students

	N	Minimum	Maximum	Mean	Std. Deviation	Skewness	Kurtosis			
	Statistic	Statistic	Statistic	Statistic	Std. Error	Statistic	Std. Error	Statistic	Std. Error	Statistic
Gender	60	1	2	1.47	0.065	0.50	0.13	0.30	-2.0	0.60
Appraisal	60	4.00	14.00	7.96	0.37	2.80	0.40	0.30	-5.8	0.60
Arousal	60	4.00	14.00	8.55	0.36	2.80	0.02	0.30	-1.08	0.60
Face expression	60	4.00	16.00	9.40	0.40	3.11	0.16	0.30	-0.41	0.60
Action tendencies	60	4.00	16.00	9.00	0.38	3.00	0.05	0.30	-0.42	0.60
Valid N (listwise)	60									

Table 8. Comparisons of indicators of math anxiety between male and female students

Indicators of Math Anxiety	Gender	Mean	Std. Deviation	Std. Error Mean
Appraisal	Male	8.5625	3.16164	0.55890
	Female	7.2857	2.41687	0.45675

Arousal	Male	8.8750	3.19021	0.56395
	Female	8.1786	2.29417	0.43356
Face expression	Male	9.4375	3.14117	0.55529
	Female	9.3571	3.14129	0.59365
Action tendencies	Male	9.0000	3.15206	0.55721
	Female	9.0000	2.89316	0.54676

Table 9. Types of math anxiety between male and female students

Types of Math Anxiety	Gender	Mean	Std. Deviation	Std. Error Mean
Everyday Numerical Anxiety	Male	7.06	2.44	0.43
	Female	8.89	3.04	0.57
Passive Observation Anxiety	Male	7.00	2.63	0.46
	Female	8.39	2.79	0.52
Performance Anxiety	Male	7.43	2.55	0.45
	Female	9.03	3.44	0.65
Mathematics Test Anxiety	Male	8.06	2.93	0.51
	Female	10.00	3.48	0.65
Problem-Solving Anxiety	Male	7.43	3.32	0.58
	Female	9.85	3.69	0.69

Conclusion

To sum up, the results of this study showed that there is no significant difference regarding math anxiety between male and female students of the Sherubtse College. Therefore, it can be mentioned that linking mathematics as a male dominance is incorrect and it is a stereotype because no such substantial difference was found in the study to reject the null hypothesis. Nonetheless, there are some limitations such as all students are not equally good with words whereas some respondents might not have understood the statement well, and also some statements were so confusing. For instance, statements like “finding who is the tallest if Pema is taller than Sonam, Pema is

shorter than Ngawang, Ngawang is taller than Sangay, and Sangay and Sonam are the same height” and “dividing the number 10,179 by 13.5 without using a calculator” while these statements does not present a clear image in which they could have understood. Another limitation of this study is that it will be difficult to generalized its findings and reports to whole population of the college because students come from different field of studies. However, this study will erase the gender-based stereotype regarding boys doing extremely well in mathematics rather than girls in the society.

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