



Gender Differences in Mathematics Anxiety: The Role of Gender Stereotypes and Self-Esteem among Students in the Faculty of Education at Tishk International University

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Abstract: Mathematics anxiety is a multidimensional psychological phenomenon that negatively impacts students' performance and engagement with mathematics. This study aims to investigate gender differences in mathematics anxiety and the role of gender stereotypes and self-esteem among students at Tishk International University, in Erbil. A quantitative approach was applied using a structured Likert-scale questionnaire distributed to 100 students across three departments of the faculty of Education. The results showed no significant gender differences in mathematics anxiety, self-esteem, or gender stereotypes. However, a weak positive correlation was observed between self-esteem and gender stereotypes, and a slight statistically significant correlation was found between gender stereotypes and mathematics anxiety. Unlike previous studies reporting strong gender effects, the findings of the present investigation suggest that mathematics anxiety in this context is shaped less by gender differences and may instead be influenced by unmeasured sociocultural and educational factors. This study suggests directions for interventions to reduce mathematics anxiety and gender stereotypes, strengthening self-esteem, and contributes to the growing knowledge in the Kurdistan region, offering implications for policymakers and educators.

Keywords: Mathematics Anxiety, Self-esteem, Gender Stereotypes, University Students, Kurdistan Region of Iraq

1. Introduction

1.1 Background of the Study

Mathematics anxiety is one of the most common and severe types of anxiety related to subject-related anxiety. It negatively impacts students' confidence, performance, and long-term commitment in math. It's more than just disliking the subject. Mathematics anxiety, characterized by Ashcraft and Moore (2009) as "feelings of tension and apprehension that interfere with the manipulation of numbers and the solving of mathematical problems," is a prevalent phenomenon that can hinder students' cognitive functioning and working memory, consequently diminishing their mathematical performance (Maloney & Beilock, 2012).

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Mathematics anxiety, frequently regarded as a singular construct, seems to comprise various components. (Wigfield & Meece, 1988) Identified two dimensions: a cognitive dimension, marked by apprehensions regarding performance and the repercussions of failure, and an affective dimension, encompassing emotional and physiological reactions, including anxiety and tension.

The cognitive part can make it a challenge to solve problems by overloading working memory with distracting thoughts. The affective component increased emotional response, which often makes people less likely to be willing to do math-related tasks. The two dimensions have been shown to predict lower performance and reduced persistence in mathematics (Barroso, 2021). Other studies show there is a high level of gender difference in mathematics anxiety where females have higher levels compared to their male counterparts. An investigation (meta-analysis) on 151 studies by Hembree (1990) produced results that female students had higher scores on mathematics anxiety at all levels of education. Also, as Devine (2012) showed, the disparity persisted when the general test anxiety was kept constant, which means that it is not only determined by the individual cognitive-emotional characteristics but that other variables also determine the observed gender differences. Gender differences were found to be high in mathematics anxiety with many studies reporting high levels of self-reports anxiety among females though the degree of the effect varied depending on the setting (Hyde, 1990).

Some of these differences could be explained by the general test anxiety; with this statistically controlled, the difference between the genders in the degree of mathematics anxiety reduces. Mathematics anxiety is not only a personal cognitive-affective condition, but it is also affected by social cultural beliefs and norms of expectations. There is a significant amount of literature on how gender stereotypes affect mathematics-related anxiety. The postulates of the stereotypes that males are inherently competent in mathematics can also make female students feel that they are not as competent in mathematics as they should be, and this increases the cognitive and emotional aspects of anxiety (Steele, 1997; Spencer, 1999). Stereotype threat is a condition which can diminish the working memory resources in solving a problem thus lowering performance (Schmader, Johns, and Forbes, 2008). These cultural influences are continually supported in recent studies. Bieg (2015) found out that, regardless of the real competence, gendered assumptions about mathematical ability were linked with higher levels of anxiety among female pupils. When Ganley and Lubienski (2016) controlled the variables of achievement, self-efficacy, and socioeconomic background, they discovered that students with stronger gender stereotypes experienced more math anxiety. Recent large-scale studies indicate that there is a significant relationship between mathematics anxiety and stereotype support (Thomas, 2022).

The concept of stereotypes in the Kurdistan Region of Iraq is due to the deeply rooted norms with cultural backgrounds influencing the academic expectations. According to a study by Al-Salihi and Mohammed (2020), the prevalence of gender roles and social stereotypes can be observed in the Kurdistan Region, where men occupy dominant roles in the public and in the family, and women are subordinate in all aspects.

These standards are embedded in traditional and tribal structures and reinforced by cultural expectations and inadequate legal protections. However, little is known about the extent to which such social stereotypes could impact academic spaces within the region. A person's overall perception of their own value and capacity, defined as self-esteem, can affect both mathematics anxiety and performance. Higher

self-esteem correlates with improved achievement and increased resilience in the face of academic struggle, including mathematics (Marsh & Craven, 2006).

Furthermore, it can reduce the negative impact of stereotype threat, such that students, especially girls, do not internalize the belief that they are deficient in mathematics (Schmader, Johns, & Forbes, 2008). In contrast to low self-esteem, which increases the susceptibility of an individual to such stereotypes and amplifies both the cognitive (worry through anxiety) and the affective (emotional connotation) aspects of mathematics anxiety, building self-esteem through a supportive classroom climate and constructive feedback can assist in the reduction of anxiety and mathematics disengagement.

Moreover, it can reduce the harmful impact of stereotype threat, preventing students from internalizing the belief that they are incompetent in mathematics (Schmader, Johns, & Forbes, 2008). In contrast, low self-esteem renders individuals more susceptible to such stereotyping, magnifying the cognitive (worried feelings) and affective (emotional feelings) dimensions of mathematics anxiety. Hence, raising self-esteem through a supportive classroom environment and positive feedback can dampen anxiety and bolster interest in mathematics.

Gender stereotypes and self-esteem are also instrumental in addressing mathematics anxiety among females studying in the Kurdistan Region, owing to the cumulative impact of cognitive, affective, and sociocultural factors involved. Little work has been done on the specific impact of such stereotypes on anxiety levels in the educational context, even though these stereotypes remain prevalent in regional discourses. In this study, we consider students within the Faculty of Education at Tishk International University and seek to identify the extent to which gender stereotypes impact mathematics anxiety and the extent to which they continue to affect students' self-esteem.

1.2 Problem Statement

As mentioned above, mathematics anxiety consists of cognitively (worrying) and affectively (emotional) components that can affect the problem-solving skills, performance, and persistence of students in mathematics. Previous studies have shown that females report higher mathematics anxiety than males do, though effect sizes vary by context.

In addition to the personal factors, the sociocultural factors especially the stereotype about the male who is more naturally gifted in mathematics compared to the female can contribute to the anxiety and the self-esteem (Steele, 1997). These gender stereotypes are supported in the Kurdistan Region by the well-established and dominant cultural attitudes that render men dominant and women subservient (Al-Salihi and Mohammed, 2020). Despite the prevalence of such social conceptions, there is limited information regarding their effects on academic experiences of students. These dynamics are also influenced by self-esteem: the higher the self-esteem the lower the stereotype threat and the lower self-esteem the higher the anxiety and related emotions in mathematics (Marsh and Craven, 2006; Schmader, Johns, and Forbes, 2008). In this light, it is important to analyze the role of gender stereotypes and self-esteem in causing mathematics anxiety in male and female students. This research will be carried out at Faculty of Education in Tishk International University, this research will attempt to fill this gap by examining the relationship between gender stereotypes, self-esteem, and mathematics anxiety in order to better understand the issues

that affect students and develop specific interventions aimed to decrease mathematics anxiety, the effects of gender stereotypical beliefs, and the improvement of self-esteem of male and female students in school.

1.3 Research Question

The primary objective of this study is to examine the interplay of gender stereotypes, self-esteem, and mathematics anxiety among male and female students in the Faculty of Education at Tishk International University.

To shed light on the main research question, this study examines the following sub-questions:

1. How do male and female students differ in their experiences of mathematics anxiety, self-esteem, and gender stereotypes?
2. How do academic department, academic year, and age influence mathematics anxiety, self-esteem, and gender stereotypes?
3. How do mathematics anxiety, self-esteem, and gender stereotypes interrelate with each other?

1.4 Research Objectives

Based on the research questions, the objectives of this study are as follows:

1. To examine the relationships between gender and self-esteem, mathematics anxiety, and gender stereotypes.
2. To investigate whether academic department, academic year, and age are associated with self-esteem, math anxiety, and gender stereotypes.
3. To explore the interrelation between gender stereotypes, self-esteem, and math anxiety.

1.5 Hypotheses

In line with the research objectives, this study proposes the following three hypotheses:

1. It can be predicted that male and female students are significantly different from one another in terms of self-esteem, mathematics anxiety, and gender stereotypes.
2. It can be predicted that academic department, academic year, and age are significantly associated with self-esteem, mathematics anxiety, and gender stereotypes among students.
3. It can be predicted that gender stereotypes, self-esteem, and mathematics anxiety are interrelated with each other.

Thus, this research is concentrated on three objectives and the respective hypotheses, which are presented in sections 1.4 and 1.5. The research seeks to determine if there are gender differences in the support of gender stereotypes, levels of self-esteem, and anxiety in mathematics; if there are differences in age, year in college, and departments with regard to the mentioned variables; and if there is a relationship between self-esteem, support of gender stereotypes, and mathematics anxiety. The methodology, results, and discussion sections are devoted to the aforementioned research objectives.

2. Literature Reviews

Mathematics anxiety is a significant psychological and educational challenge that affects students' learning, performance, and attitudes toward mathematics. To provide a thorough grasp of the subject, this section reviews the literature in four key areas: math anxiety and gender differences, the role of gender stereotypes, self-esteem within academic performance, and previous research, which reviews earlier studies in the local context.

2.1 Math Anxiety and Gender Differences

Research on gender disparities in math anxiety yields varying results. In compared to male students, a number of studies demonstrate that female students experience higher levels of anxiety, particularly in middle and high school, which has an impact on their performance and real mathematical abilities (Mier et al., 2019; Wang, Li, & Zhou, 2024; Devine, Fawcett, Szalcs, & Dowker, 2012). Gender stereotypes and societal expectations are often blamed for women's lack of self-assurance and enthusiasm in STEM professions (Beilock, Gunderson, Ramiraz, & Levine, 2010; Maloney, Ramiraz, Gunderson, Levine, & Beilock, 2015).

Nonetheless, gender differences are not always present; other research has revealed no discernible gender differences in math-related anxiety. The impact of gender on students' anxiety levels is probably influenced by contextual, educational, pedagogical, and cultural variables (Karjanto & Yong, 2015; Keshavarzi & Ahmadi, 2013). These conflicting findings highlight the need of considering context when examining and treating mathematics anxiety because it is impacted by a complex interplay of environmental, social, and individual factors. It is necessary to comprehend the distinct cultural norms, educational methods, and societal expectations in Iraqi Kurdistan in order to design appropriate interventions that diminish mathematics anxiety in female students and promote their full involvement in STEM disciplines and jobs.

2.2 The Role of Gender Stereotypes

Research has demonstrated that gender stereotypes regarding mathematical ability affect anxiety and performance through stereotype threat. Female students may underperform due to stereotype-related worries occupying their working-memory resources rather than being less capable (Steele, 1997; Spencer et al., 1999; Schmader, Johns, & Forbes, 2008). Female students who endorse gender stereotypes experience higher levels of mathematics anxiety, even after controlling for achievement (Bieg et al., 2015; Ganley & Lubienski, 2016; Goetz et al., 2019; Thomas et al., 2022). Students who think "math is for boys" struggle with higher levels of anxiety, and differences in confidence and engagement increase in classrooms where such ideas are circulated (Ganley & Lubienski, 2016). Furthermore, when such stereotypes are internalized, it causes some female students to put in less effort or avoid mathematics (Schmader, Johns, & Forbes, 2008).

There are two distinct patterns. First, there is conflicting evidence regarding the protective role of self-esteem; research has found weak or non-significant connections between mathematics anxiety and self-esteem (Devine, Fawcett, Szűcs, & Dowker, 2012; Goetz, Bieg, Lüdtke, Pekrun, & Hall, 2013). Second, some female students who hold traditional beliefs about mathematics continue to maintain a positive self-concept, demonstrating that stereotype endorsement can coexist with positive self-concept (Ganley &

Lubienski, 2016; Bieg, Goetz, & Hubbard, 2015). The findings show how psychological processes, attitudes, and social expectations all work together to influence mathematics anxiety. To address gender differences, it is necessary to encourage inclusive beliefs, minimize the acceptance of stereotypes in the classroom, and strengthen self-confidence.

2.3 Self-Esteem within Academic Performance

As stated by Tatarodi and Swann (1995) and Baumeister, Campbell, Krueger, and Vohs (2003), self-esteem is an individual's overall evaluative attitude toward themselves, reflecting both feeling of self-worth and perspectives on competence, which influence how they respond to both academic as well as individual obstacles.

In educational environments, there has been a persistent correlation between academic success, notably in mathematics, and self-esteem. Students who have a greater feeling of self-worth are more likely to exhibit resilience, persistence, and confidence when faced with academic difficulties, all of which led to better academic achievement in mathematics (Marsh & Craven, 2006). In particular, having a high sense of self-worth reduces the fear of failing and facilitates engagement with difficult mathematical topics.

Moreover, self-esteem serves as a psychological shield against the negative consequences of gender stereotypes. Students who have a high sense of self-worth, particularly female students, are less likely to absorb unfavorable cultural beliefs that men are naturally more gifted in mathematics. Instead, despite societal constraints, students are more likely to acknowledge their own abilities and maintain a good academic identity (Schmader, Johns, & Forbes, 2008). Conversely, students who have poor self-esteem are more vulnerable to stereotype threats, which exacerbate the affective (emotional) and cognitive (worry) components of mathematics anxiety. This often results in poor outcomes and avoidance of math-related tasks (Spencer, Steele, & Quinn, 1999). Additionally, boosting self-esteem not only improves mathematics performance but also promotes individual growth and further academic success. Positive reinforcement, constructive feedback, and supportive learning settings are all tried-and-true ways for increasing self-esteem in the classroom. Encourage students to move outside of their comfort zones and take on manageable tasks to boost their sense of competence and resilience. As a result, self-esteem has two functions in academic performance: it directly improves success and indirectly influences results by minimizing the effects of stereotypes and anxiety. Enhancing self-esteem should be the main objective of educational interventions targeted at improving mathematics learning and reducing student anxiety.

2.4 Theoretical Framework

The objective of this research is to investigate the role of gender stereotypes and self-esteem in mathematics anxiety for the students of the Faculty of Education, Tishk International University. Two theoretical constructions are used to describe the relationship between the variables: Stereotype Threat Theory and Social-Cognitive Theory.

Stereotype Threat Theory (Steele & Aronson, 1995) states that “being aware of negative stereotypes applied to one's own group causes anxiety.” Girls are aware of the stereotype “women are not as proficient in mathematics as men.” This awareness causes increased anxiety during mathematics problems, which in

turn affects the performance, thus demonstrating the impact of stereotypes. Social-Cognitive Theory (Bandura, 1977) states, “Self-perceptions of ability are influenced by environmental cues, experiences, and self-reflections.” Girls are exposed to the idea “math is for men only.” This idea affects the self-esteem of the girls, and the reduction in self-esteem causes an increase in mathematics anxiety.

Both theories describe the relationship between gender stereotypes and mathematics anxiety. Gender stereotypes have an impact on the self-esteem of the students, and the reduction in self-esteem causes an increase in mathematics anxiety. This phenomenon explains the differences in mathematics anxiety between the girls.

2.5 Previous Studies

In the Kurdistan region context, two studies explored mathematics anxiety, and this section offers insightful contributions to the main academic discourse.

Hamdi Serin’s (2020) research aimed to identify the causes and effects of mathematics anxiety and propose effective strategies through which students overcome this barrier and become academically successful. A conceptual, literature-based approach was employed in the research where existing research, theory, and practical interventions on mathematics anxiety were explored. Rather than conducting original empirical research, the researcher synthesized the findings of previous research to develop well-balanced recommendations.

The result of the study highlighted the root causes of math anxiety influenced by cultural stereotypes to past negative experiences, teaching methods, and self-perception. The study concluded that adopting solutions such as promoting a growth mindset, establishing strong foundations of knowledge, utilizing technology, offering emotional support, and fostering an inclusive, low-pressure classroom setting would significantly reduce anxiety and enhance students’ achievement in mathematics.

David Wafula Waswa and Mowafaq Muhammed Al-Kassam’s (2023) research aimed to identify and examine the psychological barriers of anxiety, self-confidence, attitude, and the influence of the teacher behind the negative attitude and poor enrolment of the faculty of education in an international university in the Kurdistan Region of Iraq. Quantitative analysis was conducted through structured questionnaires administered to five different departments of the Faculty of Education. The result of the research confirmed mathematics anxiety to be the most significant psychological barrier, followed closely by low self-confidence and teacher-related factors. Even though, most students held a positive attitude toward mathematics, this did not translate into higher enrolment and performance because of the overwhelming influence of mathematics anxiety and lack of self-confidence. The research also found that teachers influenced students’ attitudes, but they had a limited impact on building self-confidence. The study emphasizes the need for targeted intervention to address psychological barriers in mathematics education.

3. Methodology

This section presents the methodological framework of this current article. A quantitative approach was employed to gather and analyse data systematically and objectively. The section outlines the research design, population and sample, data collection and analysis, and ethical considerations.

3.1 Research Design

The present study uses a quantitative research approach to investigate how gender stereotypes and self-esteem effects mathematics anxiety among students at Tishk International University's Faculty of Education. For the sake of consistency and accessibility, an adapted structured Likert-scale questionnaire was utilized to collect data, which was distributed across three departments of the aforementioned faculty. The study is exploratory-descriptive, looking at whether stronger gender stereotypes are connected with higher mathematics anxiety and how much better self-esteem reduces stereotype internalization. It contrasts mathematical anxiety, self-esteem, and gender stereotype attitudes about gender, academic departments, academic years, and age categories. The questionnaires contain items from research on gender stereotypes by Ganley and Lubienski (2016), the Mathematics Anxiety Rating Scale from Richardson and Suinn (1972), and the Self-Esteem Scale from Rosenberg, (1965).

3.2 Population and Sample

Tishk International University's Faculty of Education offers courses in English Language Teaching (ELT), Biology Education, Computer Education, Mathematics Education, and Physics Education. This study focuses mostly on students in the Computer Education, Mathematics Education, and Physics Education departments, as mathematics is a common subject in their curriculum. According to the Research Center at Tishk International University (2025), 128 students are enrolled in these three departments. 100 students were chosen in accordance with Dörnyei's (2007) recommendation that a sample size of approximately 100 is sufficient for small populations and non-complex studies.

This is in line with the table by Krejci and Morgan (1970), which indicates that 97 students are statistically sufficient for descriptive and correlational designs, given a population of 128. Purposive sampling, which selects students based on characteristics relevant to the study's objectives, was employed (Palinkas et al., 2015). Students from the three departments were chosen based on their regular enrollment in mathematics-related courses as well as their availability and willingness to participate. The inclusion criteria for participation in the research were: students who are enrolled in the department of Computer Education, Mathematics Education, and Physics Education, students who have regular exposure to mathematics-related courses, and students who are willing to participate voluntarily. The exclusion criteria for the research are: students who are enrolled in departments with limited mathematics courses, and incomplete information in the questionnaires. The research students are recruited by giving out paper questionnaires during regular class sessions.

3.3 Data Collection Tool: Adapted Likert-Scale Questionnaire

A structured questionnaire was designed for data collection to answer the research questions. Since Tishk International University's faculty of Education uses English as its primary language of instruction, an English-language instrument was created to make sure all students could understand it. There were four general categories covered in the questionnaire, i.e., demographic, self-esteem, gender stereotypes, and mathematics anxiety. The questionnaire contains four sections consisting of a total of 26 items, and the non-demographic items have a 5-point Likert scale response format from "Strongly Disagree" to "Strongly Agree," with a final, open comment section available for further students' remarks. The first section

collects demographics information through 4 items requesting gender, age, department, and academic year, with a checkbox in addition to a single-selection, response format. The second section measures self-esteem through 7 items (items 5-11) assessing students' confidence in academic success, believing in overcoming challenges, self-doubt tendency, feeling proud of accomplishments, self-perceived math ability, comparing oneself to others, as well as feeling connected to the university community. The third section evaluates gender stereotypes through 7 items (items 12-18) questioning beliefs in biological mathematical ability variations in terms of gender, equal ability beliefs, equal treatment by teachers, gender effect perception in mathematics ability, impact of society's expectations, gender impact in class participation, as well as transmission of gender-stereotype math ability by peers. The fourth section evaluates mathematics anxiety through 7 items (items 19-25) measuring public problem-solving anxiety, fear of performing badly in tests, composure in taking a test, anxiety in case of not comprehending material, tension in case of preparation, evading math-course-related courses, as well as ease in asking questions in class.

3.4 Data Analysis

A self-completion questionnaire was used for collecting data, and on paper to reach as many students as possible. The responses were imported into Excel sheet and analyzed using SPSS (Statistical Package for the Social Sciences). The primary study variables and students' demographics (gender, age, department, and stage) were summarized using descriptive statistics, which included means, frequencies, and standard deviations. In the beginning, normality tests for gender stereotypes, math anxiety, and self-esteem were taken into consideration, but Professor Dr. Wasfi Kahwachi, who is a statistical expert at Tishk International University suggested they were unnecessary in this case since the sample consisted of 100 students.

The use of parametric or non-parametric analyses is supported by the Central Limit Theorem, which states that a sample size of 100 adequately approximates normality. Gender differences in mathematics anxiety, self-esteem, and stereotypes were investigated using correlation analysis and ANOVA (for more than two groups). Due to LSD's ability to detect subtle differences between group means, significant ANOVA results were followed by Least Significant Difference (LSD) post hoc tests to find pairwise differences across departments and years.

3.5 Reliability and Validity

This study ensured the reliability and validity of the data through several approaches.

3.5.1 Reliability

Internal consistency measures were used in this study to check the reliability of the questionnaire. For this study, it was ensured that the instrument was made reliable by carefully developing the questionnaire. Items were adapted from scales that were proven to be reliable in earlier studies of mathematics anxiety, self-esteem, and gender stereotypes, which were carried out in similar contexts (e.g., Hembree, 1990; Ma, 1999). Cronbach's alpha was used to assess the internal consistency of the questionnaire. The result for the 10-item scale was overall reliability of $\alpha = 0.723$, while standardized items were found to have $\alpha =$

0.721. This shows that the items are reliable to the constructs of self-esteem, gender stereotypes, and mathematics anxiety.

The following table shows the interpretation of the internal consistency that is used in different fields of humanitarian and social sciences.

Table 1: Cronbach's Alpha Interpretation Table

Cronbach's Alpha (α)	Interpretation
≥ 0.90	Excellent (High reliability)
0.80 – 0.89	Good
0.70 – 0.79	Acceptable
0.60 – 0.69	Questionable
0.50 – 0.59	Poor
< 0.50	Unacceptable

This table indicates that Cronbach's Alpha (α) is a standard coefficient used to measure the reliability and consistency of a scale used in psychological studies. The coefficient measures the extent to which a set of items relates to each other. An Alpha of 0.70 and above is typically considered acceptable in exploration studies, suggesting that the items are reliably measuring the same latent variable (George & Mallery, 2003). Anything less than this is a sign that the scale requires refining to improve the consistency level.

3.5.2 Validity

The current research is aimed at content validity that should guarantee that the questionnaire should be created to be able to cover the main aspects of mathematics anxiety, gender stereotypes, and self-esteem. The instrument had items that were based on pre-existing scales that had been tested in the past (Hembree, 1990; Ma, 1999). Mathematics instructional experts also examined items to determine content validity of the instrument.

3.6 Ethical Considerations

This study has observed all the ethical considerations established by Tishk International University. They were done voluntarily, and an informed consent was taken out of every male and female student before completing the questionnaire. Students were assured that their answers will be anonymous. No personal identifiers or names were gathered to ensure confidentiality. All data has been kept in a secure place, and it will only be utilized to this study and in an academic capacity.

3.7 Scope and Limitations

Every research is limited by some constraints which determine its scope and limits. This section gives an overview of the scope of the study, which includes students of various education departments in Tishk International University, and any limitations that would influence the interpretation of the findings. The findings of the study must be read carefully due to the following limitations.

1. The study was restricted to single faculty in one college hence the results cannot be generalized to other colleges and universities. Institutional and cultural factors may have affected the findings since Tishk International University had its own unique institutional and cultural issues.
2. To measure gender stereotypes, self-esteem and math anxiety, we used self-report questionnaires. Despite their widespread application in the research of the education field, they can be affected by the social desirability bias and fail to capture the actual attitude and behaviors of the students.
3. We did not consider the socioeconomic background, family influence, teacher quality, and previous mathematics performance. Although these variables might play a significant role in the levels of mathematics anxiety.

Nevertheless, the research illuminates the interaction of gender stereotypes and mathematics anxiety and self-esteem and identifies the alterations in this learning context as well as suggests the directions of further research and intervention.

4. Results and Discussion

After the data collection, quantitative analysis takes place that focuses on the effects of gender, department, academic year, and age on the three variables, as well as their interrelations, which were evaluated using LSD post hoc tests, reliability testing for scale consistency, and descriptive statistics for demographic data. The results were discussed in relation to previous research and interpreted in light of the three hypotheses. This section begins with a detailed description of the demographic information, followed by a reliability analysis evaluating the internal consistency of the scale's items. Additionally, the correlation of gender, department, age, and academic year are analysed to provide a detailed insight into the psychological and educational interaction of students with mathematics. The discussion of the results section is followed by an explicit examination of the three hypotheses, assessing whether gender differences exist in the main variables, whether these variables are influenced by demographic factors, and how the variables are interrelated.

4.1 Descriptive Analysis

Table 2: Descriptive Analysis of Demographic Background.

Descriptive Statistics					
	N	Minimum	Maximum	Mean	Std. Deviation
Age:	100	1	4	2.43	0.640
Department:	100	1	3	2.17	0.853
Academic Year:	100	1	4	2.42	1.257
Gender:	100	1	2	1.48	0.502
Valid N (listwise)	100				

The total sample is set to 100, and there are four categorical variables: age, department, academic year, and gender. Each variable is assigned a numerical code (e.g., 1- 4 for age and academic year, 1-3 for

department, 1-2 for gender), which may represent a category. The mean age score of 2.43 (on a 1-4 scale) indicates that the majority of students are in the middle range, most likely in their 20s. The department mean of 2.17 on a scale of 1-3 indicates a slight concentration in the middle category, while the precise department depends on the coding scheme selected.

The academic year mean of 2.42, with a greater standard deviation (1.257), indicates that the range is approximately equal throughout different years of study, and students throughout all academic years are properly represented. The gender variable, coded from 1 to 2, had a mean of 1.48 and a standard deviation of 0.502, indicating a virtually equal gender split, with a possible very little male predominance. The smaller standard deviations for gender and age imply tighter clustering around the averages, but the higher deviation for academic year indicates a more mixed student population by year of study. Overall, the sample appears to be balanced and diversified across important demographic parameters, indicating that analyses based on these data is generalizable.

4.1.1 Gender

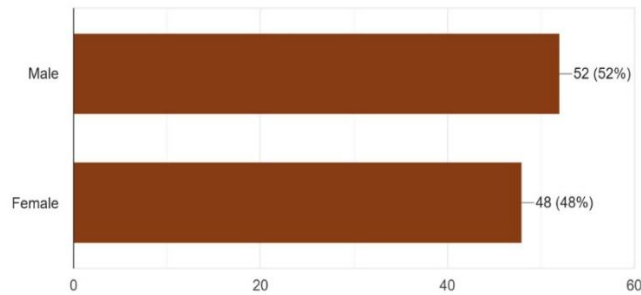


Figure 1: Gender of the Students

This figure shows a diagram illustrating the distribution of the students according to their gender. The total number of students was 52 males' students (52%), and 48 females' students (48%) took part in this study. This shows that there was a nearly balanced distribution of both genders among the students.

4.1.2 Age

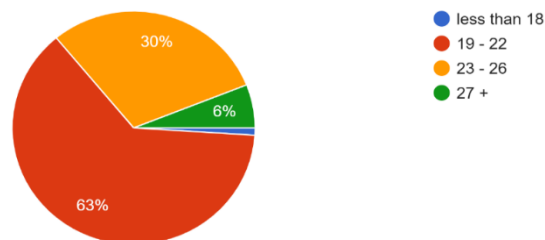


Figure 2: Age of the Students

This figure illustrates the distribution of ages among students. Most are aged 19-22 years (63%), followed by those aged 23-26 years (30%), and then 6% are aged 27 years and above, while only 1% are aged below 18 years. The majority are undergraduate students with ages that are typical for this level.

4.1.3 Department

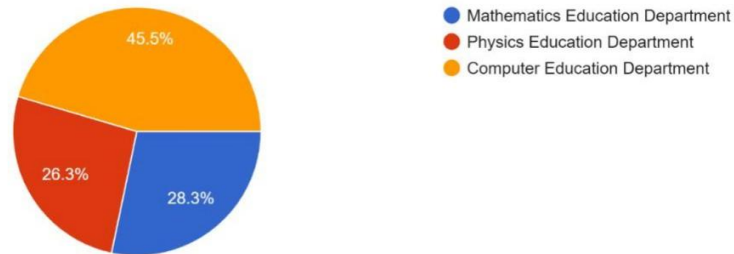


Figure 3: Departments of the Students

Figure 3 illustrates the distribution of the students among the three departments. Most of the students came from the Computer Education Department, which was 45.5%, followed by Mathematics Education, which was 28.3%, and Physics Education Department, which was 26.3%. All departments were represented, with most students from Computer Education.

4.1.4 Academic Year

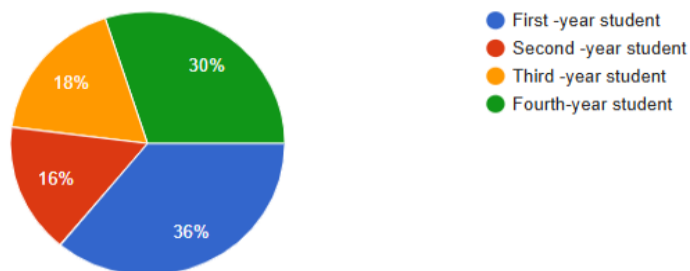


Figure 4: The Academic Year of the Students

The above figure explains the distribution of the students according to their academic years. The highest number of students are first-years at 36%, while fourth-years are second with a participation figure of 30%. The third-years are at 18%, while the second-years are at 16%.

4.2 Reliability Test

Table 3: The Cronbach's Alpha Reliability Statistics of This Study

Reliability Statistics		
Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
0.723	0.721	10

The reliability statistics table shows that Cronbach's Alpha value for a 10-item scale is 0.723, with a standardized value of 0.721. This shows that the items in the scale have acceptable internal consistency. A Cronbach's Alpha value above 0.7 is acceptable in social science research. This shows that the items in the scale consistently measure one single construct. The small difference in raw and standardized alpha values shows that there is no significant difference in variances, hence no significant standardization effect.

4.3 Correlation Analysis

The section presents statistical correlations for demographic background and the variables self-esteem, math anxiety, and gender stereotypes; the analysis of these variables may influence the outcome. By analysing these variables, the aim is to investigate the individual contribution of each of these variables and to increase the confidence levels about the accuracy of the findings.

4.3.1 Gender in Relation to Self-esteem

Table 4: Crosstabulation of Gender and Self-Esteem Scores Among students

Crosstab				
		Gender:		Total
		Male	Female	
Self-esteem	13.00	4	0	4
	15.00	0	1	1
	16.00	1	2	3
	17.00	0	2	2
	18.00	4	2	6
	19.00	2	3	5
	20.00	2	3	5
	21.00	2	4	6
22.00	4	4	8	

Table 4: Crosstabulation of Gender and Self-Esteem Scores Among students

Crosstab				
		Gender:		Total
		Male	Female	
Self-esteem	13.00	4	0	4
	23.00	8	6	14
	24.00	5	3	8
	25.00	5	4	9
	26.00	7	3	10
	27.00	4	2	6
	28.00	1	5	6
	29.00	1	0	1
	30.00	1	2	3
	31.00	1	2	3
Total		52	48	100

This crosstab shows the distribution of 100 students' self-esteem scores by gender (52 males and 48 females) is displayed in this crosstab. There are minor variations even though genders are represented throughout the whole score range (13–31). Males appear more frequently at the highest score of 26 (7 males vs. 3 females), demonstrating a wider spread, and are slightly overrepresented at the lower end (four males scored 13, while no females did). In contrast, females tend to be placed more around the middle-to-upper scores; for instance, there are five females and one male at a score of 28. Eight men and six women share the most common total score of 23. The central tendencies of the two groups are similar.

Table 5: Directional Measure of Relationship Between Genders

Directional Measures			
			Value
Nominal by Interval	Eta	Self-esteem Dependent	0.040
		Gender: Dependent	0.405

This table depicts the directional measure that uses the Eta coefficient to evaluate how strongly gender and self-esteem are associated. Gender does not seem to predict self-esteem levels when self-esteem is considered as the dependent variable, as the Eta value is 0.040, indicating a very weak relationship. The Eta value, on the other hand, is 0.405 when gender is taken into account as the dependent variable, indicating a moderate association between gender differences and variations in self-esteem. Although gender may not directly affect self-esteem, this asymmetry suggests that patterns in individual self-esteem

scores may be a reflection of underlying social or educational factors that affect male and female students in different ways.

4.3.2 Gender in Relation Gender-Stereotypes

Table 6: Crosstabulation of Gender and Gender Stereotype Scores

Crosstab				
		Gender:		Total
		Male	Female	
Gender Stereotypes	13.00	1	1	2
	16.00	3	2	5
	17.00	3	1	4
	13.00	1	1	2
	18.00	3	2	5
	19.00	3	2	5
	20.00	5	5	10
	21.00	5	7	12
	22.00	3	10	13
		Gender:		Total
		Male	Female	
	23.00	7	8	15
	24.00	4	0	4
	25.00	8	3	11
	26.00	3	1	4
	27.00	4	2	6
	28.00	0	3	3
	29.00	0	1	1

Table 6 displays the difference between male and female students in terms of their acceptance or internalizing gender stereotype beliefs. In the 100 students crosstabulation of scores (52 males and 48 females), both types are present across the whole score range (13–29); female students tend to concentrate more in the mid-to high levels, the most frequent scores being 22 and 23 (with 10 and 8 females). This profile points toward possible differences among female students in how sensitive they are to stereotypes or in their awareness of stereotypes, which could indicate greater or more internalized awareness of societal norms that call into question their math prowess. In males, there is a more even distribution across

the range, albeit with a peak around both scores 23 and 25, accounting for a wider but less intense pattern of stereotype support. It is interesting that the highest value of 29 was observed only in one female, and the lowest value of 13 was observed in surprisingly few men and women in both genders. Therefore, based on this result, the unevenness in the score indicates that female students may be more affected by, or sensitive to, stereotype cues, possibly because of exposure to lived academic or cultural environments that undermine their capacity to achieve mathematically. Overall, the results suggest that, although gender-stereotyped attitudes are encountered by both male and female students, females may more often internalize certain messages, highlighting the relevance of targeting stereotype beliefs in interventions.

Table 7: Directional Measures of Association between Gender and Gender Stereotypes Using Eta Coefficient

Directional Measures			
			Value
Nominal by Interval	Eta	Gender Stereotypes Dependent	0.017
		Gender: Dependent	0.419

This table utilizes the Eta values to show the connection strength between gender and the gender-related issues. When gender stereotype is the dependent variable, the Eta value of 0.017 shows that there is a very weak relationship. Thus, it can be stated that students' gender stereotypes and beliefs about math are almost completely unaffected by students' gender. On the other hand, the Eta is 0.419, indicating a moderate association, when gender is the dependent variable. This implies that while there is some variation in responses to stereotype-related questions between each gender, the difference is still insignificant. The unevenness of these values implies that gender may be a relatively weak predictor of how people respond to these stereotype beliefs.

4.3.3 Gender in Relation to Mathematics Anxiety

Table 8: Crosstabulation of Gender and Mathematics Anxiety Scores

Crosstab				
		Gender:		Total
		Male	Female	
Mathematics Anxiety	14.00	2	1	3
	15.00	2	2	4
	16.00	1	1	2
	17.00	3	2	5
	18.00	0	3	3

	19.00	6	0	6
	20.00	7	0	7
	21.00	4	9	13
	22.00	5	6	11
	23.00	8	8	16
	24.00	6	8	14
	25.00	1	3	4
	26.00	2	3	5
	27.00	3	1	4
	29.00	2	1	3
Total		52	48	100

The crosstabulation examines how math anxiety scores are distributed across genders. Female students are concentrated in the 21–25 anxiety score range, reflecting a relatively constant level of moderate-to-high anxiety. The male students are spread out across both the low (e.g., 14–17) and the higher end (19–20) of the scale. Notably, only male students had math anxiety scores of 19.00 and 20.00 (6 and 7 cases, respectively). This suggests that the male subgroup in this sample was more likely to exhibit very high anxiety responses and implies that the very highest scores of mathematics anxiety are less common among females than one might expect.

Table 9: Association of Gender with the Dependent Variable Using Eta Coefficient

Directional Measures			
			Value
Nominal by Interval	Eta	Mathematics Anxiety Dependent	0.070
		Gender: Dependent	0.461

The Eta values measuring the strength of correlation between gender (nominal) and mathematics anxiety (interval) are shown in this table. The Eta value of 0.070 indicates a very weak effect of gender when mathematics anxiety is the dependent variable. Conversely, the Eta value of 0.461 reveals a moderate correlation between variations in gender and in mathematics anxiety when gender is considered as the dependent variable.

Table 10: Case Processing Summary for Gender-Based Analysis of Self-Esteem, Gender Stereotypes, and Mathematics Anxiety

Case Processing Summary						
		Cases				
		Valid		Missing		Total
		N	Percent	N	Percent	N
						Percent

Self-esteem * Gender:	100	100.0%	0	0.0%	100	100.0%
Gender stereotypes * Gender:	100	100.0%	0	0.0%	100	100.0%
Mathematics anxiety * Gender:	100	100.0%	0	0.0%	100	100.0%

A case summary of gender-based analyses for the variables being studied is shown in this table. The case processing summary demonstrates that there are 100 valid cases out of 100 for each variable, including self-esteem, gender stereotypes, and mathematics anxiety. Since there had been no missing data, any possibility of bias or information loss was eliminated. This completeness supports confidence that the results accurately reflect the sample and improves the analyses' dependability.

4.3.4 Demographic Background: Age

Table 11: One-Way ANOVA Results for the Effect of Age on Self-Esteem, Gender Stereotypes, and Mathematics Anxiety

ANOVA						
		Sum of Squares	Df	Mean Square	F	Sig.
self-esteem	Between Groups	14.044	3	4.681	0.260	0.854
	Within Groups	1730.706	96	18.028		
	Total	1744.750	99			
Gender stereotypes	Between Groups	31.495	3	10.498	0.926	0.431
	Within Groups	1087.865	96	11.332		
	Total	1119.360	99			
Mathematics anxiety	Between Groups	13.315	3	4.438	0.373	0.772
	Within Groups	1141.275	96	11.888		
	Total	1154.590	99			

A one-way ANOVA was conducted to determine whether self-esteem, gender stereotypes, and math anxiety varied across groups. For self-esteem, the between-groups variance ($F = 0.260$, $p = 0.854$) was not statistically significant, suggesting that self-esteem scores were not significantly impacted by group membership. Group membership could not have had much of an impact on gender stereotype scores, as the analysis for gender stereotypes revealed no significant differences between groups ($F = 0.926$, $p = 0.431$). Additionally, there was no significant difference in mathematics anxiety between groups (F -value = 0.373 , $p = 0.772$). Overall, these findings show that self-esteem, gender stereotypes, and mathematics anxiety did not differ statistically significantly among the groups studied, indicating that these variables were relatively consistent across this sample's group classifications.

4.3.5 Demographic Background: Department

Table 12: One-Way ANOVA Results for the Effect of Academic Department on Self-Esteem, Gender Stereotypes, and Mathematics Anxiety

ANOVA						
		Sum of Squares	Df	Mean Square	F	Sig.
Self-esteem	Between Groups	251.976	2	125.988	8.187	0.001
	Within Groups	1492.774	97	15.389		
	Total	1744.750	99			
Gender stereotypes	Between Groups	57.433	2	28.717	2.623	0.078
	Within Groups	1061.927	97	10.948		
	Total	1119.360	99			
Mathematics anxiety	Between Groups	14.161	2	7.081	0.602	0.550
	Within Groups	1140.429	97	11.757		
	Total	1154.590	99			

A one-way ANOVA was conducted to examine differences in mathematics anxiety, gender stereotypes, and self-esteem across the groups. Group membership appeared to have a significant impact on self-

esteem scores, as confirmed by the results, which depicted a significant difference in self-esteem between groups ($F(2, 97) = 8.187, p = 0.001$). In contrast, there were no significant differences observed for mathematics anxiety ($F(2, 97) = 0.602, p = 0.550$) or gender stereotypes ($F(2, 97) = 2.623, p = 0.078$), suggesting that these factors were relatively consistent among the groups. These results demonstrate that while gender stereotypes and mathematics anxiety are largely unaffected by group-related factors, self-esteem is sensitive to them in this sample.

Table 13: LSD Post Hoc Multiple Comparisons for Departmental Differences in Self-Esteem, Gender Stereotypes, and Mathematics Anxiety

Multiple Comparisons							
Dependent Variable	(I) Department:	(J) Department:	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
						Lower Bound	Upper Bound
Self-esteem	Mathematics Education Department	Physics Education Department	1.06207	1.07063	0.324	-1.0628	3.1870
		Computer Education Department	3.57946*	.93017	0.000	1.7333	5.4256
	Physics Education Department	Mathematics Education Department	-1.06207	1.07063	0.324	-3.1870	1.0628
		Computer Education Department	2.51739*	.97475	0.011	0.5828	4.4520
	Computer Education Department	Mathematics Education Department	-3.57946*	.93017	0.000	-5.4256	1.7333
		Physics Education Department	-2.51739*	.97475	0.011	-4.4520	-.5828

Gender stereotypes	Mathematics Education Department	Physics Education Department	0.31862	.90300	0.725	- 1.4736	2.1108
Dependent Variable	(I) Department:	(J) Department:	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
						Lower Bound	Upper Bound
Self-esteem	Mathematics Education Department	Physics Education Department	1.06207	1.07063	0.324	- 1.0628	3.1870
		Computer Education Department	3.57946*	.93017	0.000	1.7333	5.4256
	Physics Education Department	Mathematics Education Department	-1.06207	1.07063	0.324	- 3.1870	1.0628
		Computer Education Department	2.51739*	.97475	0.011	0.5828	4.4520
	Computer Education Department	Mathematics Education Department	-3.57946*	.93017	0.000	- 5.4256	-1.7333
		Physics Education Department	-2.51739*	.97475	0.011	- 4.4520	-.5828
Gender stereotypes	Mathematics Education Department	Physics Education Department	0.31862	.90300	0.725	- 1.4736	2.1108
Dependent Variable	(I) Department:	(J) Department:	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
						Lower Bound	Upper Bound
Mathematics anxiety		Computer Education Department	0.69565	0.85198	0.416	-.9953	2.3866

	Computer Education Department	Mathematics Education Department	-0.79910	0.81302	0.328	-2.4127	0.8145
		Physics Education Department	-0.69565	0.85198	0.416	-2.3866	0.9953

The LSD post-hoc analysis revealed that students' self-esteem in Computer Education scored higher than students in Mathematics Education ($M_{diff} = 3.58, p < .001$) and Physics Education ($M_{diff} = 2.52, p = .011$), whereas students in Mathematics and Physics did not differ in their self-esteem. There was a single significant difference in gender stereotypes: Computer Education students endorsed more stereotypes than mathematics Education Students ($M_{diff} = 1.65, p = .038$), with other non-significant comparisons. Since none of the pairwise differences were significant, mathematics anxiety did not differ by department. These results imply that departmental connection has little impact on mathematics anxiety, moderately influences gender stereotypes, and has a strong relationship with self-esteem.

4.3.6 Demographic Background: Academic Year

Table 14: One-Way ANOVA Results for the Effect of Academic Year on Self-Esteem, Gender Stereotypes, and Mathematics Anxiety

ANOVA						
		Sum of Squares	Df	Mean Square	F	Sig.
Self-esteem	Between Groups	28.446	3	9.482	0.530	0.663
	Within Groups	1716.304	96	17.878		
	Total	1744.750	99			
Gender stereotypes	Between Groups	144.028	3	48.009	4.725	0.004
	Within Groups	975.332	96	10.160		
	Total	1119.360	99			
Mathematics anxiety	Between Groups	58.623	3	19.541	1.712	0.170
	Within Groups	1095.967	96	11.416		

ANOVA						
		Sum of Squares	Df	Mean Square	F	Sig.
Total		1154.590	99			

A one-way ANOVA was conducted to investigate variations in self-esteem, gender stereotypes, and math anxiety across the groups. Math anxiety ($F(3, 96) = 1.712, p = 0.170$) and self-esteem ($F(3, 96) = 0.530, p = 0.663$) did not differ significantly between the groups, according to the analysis. Nevertheless, a significant difference in gender stereotypes was observed ($F(3, 96) = 4.725, p = 0.004$), suggesting that students' perceptions of gender stereotypes were influenced by their group membership. Overall, these findings demonstrate that gender stereotypes demonstrate significant differences, implying the possible influence of group-related factors on students' gender-related attitudes, whereas self-esteem and mathematics anxiety did not vary significantly by group.

Table 15: LSD Post Hoc Multiple Comparisons for Academic Year Differences in Self-Esteem, Gender Stereotypes, and Mathematics Anxiety

Multiple Comparisons							
Dependent Variable	(I) Academic Year:	(J) Academic Year:	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
						Lower Bound	Upper Bound
Self-esteem	First year student	Second year student	-.36806	1.27043	0.773	-2.8898	2.1537
		Third year student	-.33333	1.22059	0.785	-2.7562	2.0895
		Fourth year student	-1.28889	1.04525	0.221	-3.3637	0.7859
	Second year student	First year student	.36806	1.27043	0.773	-2.1537	2.8898
		Third year student	0.03472	1.45280	0.981	-2.8491	2.9185

Multiple Comparisons								
Dependent Variable	(I) Academic Year:	(J) Academic Year:	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval		
						Lower Bound	Upper Bound	
		Fourth year student	-.92083	1.30894	0.483	-3.5191	1.6774	
		First year student	0.33333	1.22059	0.785	-2.0895	2.7562	
	Third year student	Second year student	-.03472	1.45280	0.981	-2.9185	2.8491	
		Fourth year student	-.95556	1.26062	0.450	-3.4579	1.5468	
		First year student	1.28889	1.04525	0.221	-.7859	3.3637	
			Second year student	.92083	1.30894	0.483	-1.6774	3.5191
			Third year student	.95556	1.26062	0.450	-1.5468	3.4579
Gender stereotypes	First year student	Second year student	-2.64583*	0.95770	0.007	-4.5469	-.7448	
		Third year student	-1.52778	0.92013	0.100	-3.3542	0.2987	

Dependent Variable	(I) Academic Year:	(J) Academic Year:	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
						Lower Bound	Upper Bound
		Fourth year student	-2.68333*	0.78795	0.001	-4.2474	-1.1193
		First year student	2.64583*	.95770	0.007	.7448	4.5469
	Second year student	Third year student	1.11806	1.09518	0.310	-1.0559	3.2920
		Fourth year student	-.03750	0.98673	0.970	-1.9961	1.9211
		First year student	1.52778	0.92013	0.100	-.2987	3.3542
	Third year student	Second year student	-1.11806	1.09518	0.310	-3.2920	1.0559
			Fourth year student	-1.15556	0.95031	0.227	-3.0419
		Fourth year student	First year student	2.68333*	0.78795	0.001	1.1193
Second year student			0.03750	0.98673	0.970	-1.9211	1.9961
Third year student			1.15556	0.95031	0.227	-.7308	3.0419
			Second year student	-1.37500	1.01520	.179	-3.3902
Mathematics anxiety	First year student	Second year student	-1.37500	1.01520	.179	-3.3902	0.6402

Dependent Variable	(I) Academic Year:	(J) Academic Year:	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
						Lower Bound	Upper Bound
		Third year student	1.25000	0.97538	0.203	-.6861	3.1861
		Fourth year student	.11667	0.83526	0.889	-1.5413	1.7747
		First year student	1.37500	1.01520	0.179	-.6402	3.3902
	Second year student	Third year student	2.62500*	1.16093	0.026	.3206	4.9294
		Fourth year student	1.49167	1.04598	0.157	-.5846	3.5679
Dependent Variable	(I) Academic Year:	(J) Academic Year:	Mean Difference (I-J)	Std. Error	Sig.	Lower Bound	Upper Bound
	Third year student	First year student	-1.25000	0.97538	0.203	-3.1861	0.6861
		Second year student	-2.62500*	1.16093	0.026	-4.9294	-.3206
		Fourth year student	-1.13333	1.00736	0.263	-3.1329	0.8663
	Fourth year student	First year student	-.11667	0.83526	0.889	-1.7747	1.5413
		Second year student	-1.49167	1.04598	0.157	-3.5679	0.5846

Dependent Variable	(I) Academic Year:	(J) Academic Year:	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
						Lower Bound	Upper Bound
		Third year student	1.13333	1.00736	0.263	-.8663	3.1329

*. The mean difference is significant at the 0.05 level.

The post-hoc multiple comparison results demonstrate that self-esteem does not differ significantly across academic years, as none of the pair-wise mean differences reached statistical significance (all $p > .22$). This would suggest that as students' self-esteem remains relatively stable throughout their progression from the first to the fourth year. Conversely, significant differences were found for gender stereotypes; third graders' scores did not differ significantly. While first-year students reported significantly lower endorsement of gender stereotypes than both second-year students ($M_{diff} = -2.65, p = .007$) and fourth-year students ($M_{diff} = -2.68, p = .001$). No significant differences were observed among the upper years (years 2, 3, and 4). This pattern suggested that stereotypes are less internalized during the first year but increase by the second year and stay relatively greater and higher after that. The majority of comparisons regarding mathematics anxiety were not significant. With the exception of the second versus third year comparison, where second-year students reported significantly higher anxiety than third-year students ($M_{diff} = 2.63, p = .026$). Overall, these results show that self-esteem remains unchanged over time, gender stereotypes increase and remain elevated after the first year, and mathematics anxiety peaks in the second year before subsiding.

4.3.7 Correlation between Self-esteem, Mathematics Anxiety, and Gender Stereotypes

Table 16: Spearman's rho Correlation Coefficients Among Self-Esteem, Gender Stereotypes, and Mathematics Anxiety

Correlations					
			Self-esteem	Gender stereotypes	Mathematics anxiety
Spearman's rho	Self-esteem	Correlation Coefficient	1.000	0.322**	0.121
		Sig. (2-tailed)	.	0.001	0.230
		N	100	100	100

	Gender stereotypes	Correlation Coefficient	0.322**	1.000	0.203*
		Sig. (2-tailed)	0.001	.	0.043
		N	100	100	100
	Mathematics anxiety	Correlation Coefficient	0.121	0.203*	1.000
		Sig. (2-tailed)	0.230	0.043	.
		N	100	100	100
**. Correlation is significant at the 0.01 level (2-tailed).					
*. Correlation is significant at the 0.05 level (2-tailed).					

The correlations between mathematics anxiety, gender stereotypes, and self-esteem were investigated using the Spearman correlation analysis. Gender stereotypes and self-esteem had a significant and positive correlation ($r = 0.322$, $p = .001$), suggesting that in this sample, higher self-esteem is linked to more endorsement of gender stereotypes. Nonetheless, self-esteem and mathematics anxiety had no significant correlation with each other ($r = 0.121$, $p = .230$), indicating that students' perceived self-worth and anxiety levels related to mathematics are not necessarily related. Students who endorse more gender stereotypes are likely to report slightly higher levels of mathematics anxiety, according to a weak but significant positive correlation between gender stereotypes and mathematics anxiety ($r = 0.203$, $p = .043$). Overall, these results point to a modest interrelationship between the three variables: mathematics anxiety and self-esteem seem to be independent, while gender stereotype endorsement and self-esteem are somewhat correlated.

4.4 Discussion

The present study explored the relationship between mathematics anxiety, gender stereotypes, and self-esteem among students within the Faculty of Education at Tishk International University. The study examined three hypotheses: 1) male and female students differ significantly in self-esteem, mathematics anxiety, and gender stereotypes. 2) academic department, academic year, and age have significant correlations with these psychological variables, and 3) gender stereotypes, self-esteem, and mathematics anxiety are interconnected. The findings allow us to assess these hypotheses in conjunction with the presented results and prior studies reviewed in the above-mentioned sections.

4.4.1 Hypothesis one is rejected:

The study found no significant gender differences in mathematics anxiety, self-esteem, or gender stereotypes. The result contradicts much of the global literature that consistently found higher mathematics anxiety among female students (Hyde et al., 1990; Devine et al., 2012; Bieg et al., 2015; Goetz et al., 2019). However, it aligns with recent research showing that the gender differences in mathematics anxiety depend on context and may not be universal (Ganley & Lubienski, 2016). The lack of differences in our sample may be explained by the shared academic environment within the Faculty of Education, where

both male and female students are exposed to similar learning environments, reducing gender differences. Nevertheless, this outcome should be interpreted with caution due to the limited sample size ($n = 100$) and the single-institution focus, which limits the potential for generalization. From a theoretical perspective, the study can only provide a small level of support for Stereotype Threat Theory. This theory proposes that awareness of negative stereotypes can lead to anxiety, especially among female students. However, there were no significant differences noted between the two genders, which may imply that stereotype threat may not play a role here, or that a mixed educational environment can reduce stereotype threat.

4.4.2 Hypothesis two is partially supported:

Regarding demographic variables, the research findings revealed no significant differences in mathematics anxiety, gender stereotypes, or

self-esteem across age groups or academic years, with the possible exception of gender stereotypes, which displayed significant differences across academic years. Self-esteem differed significantly by department, with students studying computer education reporting higher levels of self-esteem than those studying mathematics education or physics education. This partially supports the hypothesis and demonstrates that academic context affects some psychological variables but not in relation to other factors. These results are consistent with those of Waswa & Al-Kassam (2023), who discovered that departmental and instructional contexts greatly influenced psychological barriers to learning mathematics. Nevertheless, according to their research, anxiety was more affected than self-esteem. These findings can be understood through Social-Cognitive Theory, which points to the impact of surroundings and education on students' perception of themselves. These differences in self-esteem among departments could also be a result of different learning experiences, supporting the idea that students' perception of themselves is influenced by their surroundings.

4.4.3 Hypothesis three is partially supported:

The results of the correlation analysis showed a moderately positive relationship between self-esteem and gender stereotype endorsement, as well as a weak but significant relationship between gender stereotypes and mathematics anxiety. Although the linearity is not straightforward, both of these results are consistent with the interconnection hypothesis. There is a positive correlation between self-esteem and stereotype endorsement, which is counterintuitive. This is because higher self-esteem is generally thought to serve as a shield against the internalization of stereotypes (Schmader, Johns, & Forbes, 2008). Rather, the results imply that even self-confident students in this context might support conventional gender stereotypes, perhaps in an effort to reconcile their individual abilities with widespread social expectations. This paradox is similar to what Ganley & Lubienski (2016) found when they noted that self-confidence and stereotype endorsement can coexist. Similarly, female students who supported traditional gender beliefs about mathematics did not necessarily report lower self-esteem, as observed by Bieg et al. (2015). Meanwhile, Goetz et al. (2013) observed that lower mathematics anxiety in academic settings is not always predicted by overall self-esteem. The relationship between gender stereotypes, self-esteem, and math anxiety is partially consistent with Stereotype Threat Theory and Social-Cognitive Theory. For example, stereotypes do seem to be related to math anxiety, as evidenced by the positive relationship

between gender stereotypes and math anxiety. However, the relationship between self-esteem and math anxiety is not strong, suggesting a more complex relationship than the theories alone suggest.

Overall, despite the lack of significant gender-based differences, this study somehow reveals that stereotypes and self-esteem are linked with mathematics anxiety. Moreover, findings reveal that the cultural background of these students entrenched gender stereotypes in Kurdistan (Al-Salihi & Mohammed, 2020), and it subtly influences their self-esteem in academic settings.

5. Conclusions

The study's tested hypotheses yield a diversity of results. Since gender differences in mathematics anxiety, gender stereotypes, and self-esteem were not statistically significant, the first hypothesis was not supported. The department and academic year were having modest significant effects, particularly regarding gender stereotypes and self-esteem, which in turn partially supported the second hypothesis. Although the patterns were weaker and more contradictory than anticipated, the third hypothesis was partly supported: there were correlations between mathematics anxiety, gender stereotypes, and self-esteem.

These findings both support and contradict previous studies. Although previous research has focused on the persistence of gender differences in anxiety (Hyde et al., 1990; Devine et al., 2012; Bieg et al., 2015), our study is more in line with Ganley & Lubienski (2016), who underlined the contextual variability of these differences. Furthermore, stereotype threat theory (Steele, 1997; Spencer et al., 1999) is supported by the observed association between anxiety and stereotypes, but it also points out that the strength of these relationships may differ depending on the context.

The overall contribution of this study is to show that mathematics anxiety in the Tishk International University Faculty of Education is not significantly gender-specific but rather is still entangled with personal self-esteem and more general stereotypes. This emphasizes the necessity of interventions that both critically question current gendered notions about mathematics and help students become more confident in themselves. Even though the results are limited by methodological limitations, specifically sample size, single-institution scope, and self-reporting, they still offer insightful data regarding the academic environment at the Tishk International university and leading the way toward more comprehensive future research.

5.1 Recommendations

According to the findings, especially the observed relation between the variables self-esteem, gender stereotypes and math anxiety, the following suggestions can be made for faculty members, administrators and, policy makers from Tishk International University as follows:

5.1.1 Self-Esteem Building Activities:

Teacher ought to utilize techniques that increase students' self-esteem in mathematics and related subjects, considering the relationship between math anxiety and self-esteem. This includes emphasizing efforts over natural abilities, providing helpful and encouraging criticism, fostering opportunities for mastery, and acknowledging small successes.

5.1.2 Proactive Confrontation of Gender Stereotypes:

While gender differences were generally not covert, the relationship between stereotypes and anxiety suggests that gender stereotypes still have an impact. Since gender stereotypes are associated with math anxiety, teachers should work to combat these stereotypes with awareness and teaching strategies. Resources and discussions should emphasize that math ability is equal for both genders to minimize math anxiety caused by stereotypes.

5.1.3 Create Support Around Math Anxiety:

Consider mathematics anxiety as a valid barrier for students. Provide support through counselling services with training in academic anxiety, peer support groups, or anxiety management and study skills in the context of mathematics workshops.

5.1.4 Create a Culture of Growth Mindset:

Develop a classroom and academic culture that emphasizes a growth mindset by understanding that abilities can be developed through effort. This goes against fixed-ability beliefs typically related to stereotypes and anxiety. At the institutional level, it is recommended that policymakers support the inclusion of psychological support programs and inclusive education methods in education policies in order to alleviate mathematics anxiety and provide all students with equal opportunities in their learning.

5.2 Future Works

This study, despite its contribution to literature, it has several limitations, which can be a guide for future research. For instance, the small sample size, coupled with the fact that it is a single-institution study, limits the generalizability of this study. Future research should aim to use a larger sample population, representing more than a single university, including those within and outside the Kurdistan region. Moreover, the use of self-reported data is also a limitation, as it is prone to social desirability effects. Future research should aim to use mixed-methods or experimental designs to help control this limitation. Moreover, this study did not explore other variables, such as students' prior performance in math, family socioeconomic status, or family expectations. To understand the interaction of these variables with gender stereotypes and self-esteem, future research should aim to use longitudinal or multivariate designs, as this can help explain the underlying mechanism for mathematics anxiety.

5.2.1 Develop and test interventions that might decrease stereotypes early in academic education:

Since first-year students scored higher on gender stereotype endorsement than others, designing workshops and curriculum modifications that confront these stereotypes during the early years of students' academic careers should be the focus of future research. Longitudinal studies are then required to assess whether such interventions can, in the longer term, have positive impacts on self-esteem and math anxiety.

5.2.2 Investigate academic pressure across the various stages of the educational career:

Given that math anxiety grows during the third year of studies, researchers may well investigate how academic load, exam stress, and expectations impact emotional well-being at different stages. Pinpointing

major sources of pressure would enable institutions to provide targeted academic and psychological support.

5.2.3 Examine the stereotype internalization across varying cultural or educational contexts

As stereotype awareness varies and could be related to self-esteem and math anxiety, future studies should contrast how students from different countries, styles of teaching, or even disciplines internalize gender norms related to mathematics.

5.2.4 Apply qualitative methods to develop a deeper insight

Extending the study to interviews or open-ended surveys (qualitative approach) could gain an understanding of why and how some students feel anxious or endorse stereotypes.

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