



Moderating Influence of Gender in Relation to Test Anxiety and Self-efficacy on Students' Academic Achievement

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Abstract

This study determined the moderating influence of gender in relation to test anxiety and self-efficacy on students' achievement in Statistics. Two research questions and two null hypotheses guided the study. The researchers adopted Correlational research design involving 362 participants in the study using multistage sampling procedure. Statistics Test Anxiety Inventory, Statistics Self-efficacy Scale and Statistics Achievement Test were instruments used for data collection and they were validated by experts. The internal consistency reliability indices for STAI and SSS were determined to be 0.86 and 0.69 respectively using Cronbach Alpha, while the internal consistency reliability index for SAT was established to be 0.94 using Kuder-Richardson formula (KR₂₀). The research questions were answered using regression analysis while the hypotheses were tested with ANOVA statistics. The findings revealed no significant moderating influence of gender on the amount of variation in students' academic achievement in statistics that can be attributed to their test anxiety and self-efficacy. Teachers should be able to utilise effective strategies in teaching statistics aspect of mathematics, which will consequently enable students to develop better self-efficacy and reduce their test anxiety with respect to statistics. This will thereby help to improve the academic achievement of students in statistics component of mathematics in general.

Keywords: Academic achievement, mathematics education, statistics, student gender, test anxiety, self-efficacy

Introduction

Statistics is an aspect of mathematics that involves a systematic process of gathering and converting data into information in order to understand and apply the information appropriately in solving problems. Also, statistics is the art of collecting, organising, analysing, representing and making summary or conclusions based on data gathered (Dietz et al., 2015). Statistics involves the use of data, making meaning of quantitative and qualitative data. Various importance of the knowledge of statistics has been identified by past researchers in its application to various aspects of life.

Statistics is employed not only in mathematics but in every branch of knowledge to make concrete decisions, change and develop the world at large. Due to this reason, it is taught at all educational levels even at the tertiary level as statistics courses are key requirement for many university programs (McGrath et al., 2015). Franklin, et al. (2015) stated that the knowledge of statistics is essential for individuals to competently make daily and continuous decisions based on data. At the secondary school level, the knowledge of statistics helps students understand other topics in mathematics. This was further explained by Koparan and G"uven (2014) who stated that the knowledge of statistics is used in the field of mathematics to understand topics which involves data presentation and interpretation. It is also applied in diverse fields in order to understand and interpret information and make correct decisions which are relevant in developing and improving the society. This implies that, individuals need to acquire the knowledge and skills of statistics in order



to understand and interpret information and assertions in diverse fields like economics, social science, commerce, business management, government and science (Bhardwaj & Sharma, 2013).

The knowledge of statistics is therefore very important in mathematics at the secondary school level of education and in diverse fields. It is because of the enormous importance of statistics that the researcher focused on statistics. It is essential to note that the concept of mathematics encompasses diverse topics. These topics have been classified into homogeneous aspects or areas, and these aspects are broadly referred to as topics in mathematics according to the mathematics curriculum by the Nigerian Educational Research and Development Council (NERDC) in 2014. Studies have been carried out on students' academic achievement in relation to gender (Arnup et al., 2013; Fisher et al., 2013; Owan, 2020). The findings showed that students' gender may have an influence on students' academic achievement. Although, past reports revealed that test anxiety and self-efficacy may have an influence on students' academic achievement as identified above, however, this may differ by gender (Kassaw & Astatke, 2017; Kaur & Kaur, 2019; Batiibwe et al., 2020; Akshaya et al., 2021). Therefore, the knowledge of the moderating influence of gender on the amount of variation in secondary school students' academic achievement in statistics that can be attributed to their test anxiety and self-efficacy would help to determine how test anxiety and self-efficacy may be fundamentally different for male and female students. It was necessary to investigate whether gender moderates the amount of variation of secondary school students' academic achievement in statistics that can be attributed to their test anxiety and self-efficacy.

Gender is an attribute which characterises an individual as being a male or a female in relation to the individuals' behaviour or features of masculinity and femininity. It refers to the distinction between being a male and a female with respect to the range of physical, biological and behavioural characteristics (Akinyemi & Ebimomi, 2020). Gender has been shown by previous studies to be a factor which may influence students' academic achievement in mathematics. A study by Arnup et al. (2013) asserted that male students have better mathematical achievement when compared to female students. In contrast, a study by Fisher et al. (2013) stated that female students were more motivated to learn when compared to male students which led to them achieving better academically in mathematics.

Considering the relationship between students' gender and the factors that may influence their achievement in mathematics, results of the studies conducted by Clutts (2010); Batiibwe et al. (2020) revealed that there is no significant difference between female and male students' self-efficacy in mathematics. While reports from Peters (2013); Kassaw and Astatke (2017) indicated that gender plays a role in mathematics self-efficacy. Furthermore, Ameen et al. (2016) reported that female students experience higher anxiety levels in mathematics tests than male students. Whereas, in another study by Ihekwoaba, et al. (2020); Puteh and Khalin (2016), it was observed that there is no significant difference between female and male students' anxiety in mathematics. Therefore, past studies have shown that there have been contradictory reports on the moderating influence of gender on students' test anxiety, self-efficacy and academic achievement. Due to this, no deduction can be made on the moderating influence of gender on these variables. It is on the basis of this that the researchers investigated the moderating variable 'gender' in determining the extent to which test



anxiety and self-efficacy predict secondary school students' academic achievement in statistics.

Literature Review

Statistics as a Topic in Mathematics

Statistics is an aspect of mathematics which develops the thinking ability of individuals with respect to data gathered so as to draw reasonable conclusion based on interpretation or analysis of data. Statistics is seen as a crucial subject since future individuals in all countries must be able to navigate in a data-driven world and hence must possess skills and knowledge in data gathering, organisation, analysis and interpretation. The term statistics refers to the discipline that is concerned with the theory and practice of data collection, data description and analysis following a systematic method (Saheed & Karim, 2018). Statistics is essential in mathematics as it provides students with the knowledge of data presentation which is crucial in topics that involve the use of diagrams or tables and analysis of numerical data. Without the proper application of statistical methods, there is a great danger that data collection will incur problems, yield poor results and ultimately lead to incorrect conclusions in various aspects of mathematics (Awe, 2012). Therefore, statistics is very significant in mathematics.

Statistics is incredibly significant in mathematics because it is used in many different domains. Due to its educational significance, it is taught at various levels of education. At the tertiary level, possessing rudimentary research knowledge is of extreme necessity for undergraduate and postgraduate students in a research university where the production of a well written thesis is one of the major requirements for a bachelors' degree and postgraduate conferment (Koh & Zawi, 2014). Nevertheless, the foundation for the knowledge of statistics is laid from the primary school level through the secondary school level of education.

Statistics is one of the topics in mathematics taught at the primary and secondary educational level in Nigeria. At the primary school level, pupils are taught basic everyday statistics which includes population and measures of dispersion; at the junior secondary level, students are also taught basic everyday statistics with the addition of data presentation; at senior secondary one (SS I) level, students are taught data presentation; it is only at the senior secondary two (SS II) level that students are extensively taught statistics with respect to various topics which include: measures of central tendency (mean, median and mode), measures of dispersion (range, interquartile range, semi-interquartile range, variance and standard deviation), histograms, cumulative frequency graph and Probability (NERDC, 2014).

The in-depth understanding of topics in statistics at the SS II educational level is important. Also, the knowledge of statistics is utilised in a variety of fields, not just mathematics, to make concrete decisions, modify and advance the world at large. Despite the importance of statistics and therewith mathematics, the academic achievements of students has been unsatisfactory. Research has shown that students' mathematical achievement has declined over time. This has been attributed to students' weakness in certain areas of mathematics which includes statistics. This is evident in the WAEC Chief Examiner's report from 2016 to 2019, which showed that statistics was a consistent area of weakness in mathematics paper 2 of WASSCE.



Furthermore, the WAEC Chief Examiner's reports (from 2016 to 2019) revealed that students lack sufficient statistical understanding. The reports from 2016 to 2019 revealed that students were unable to grasp statistical concepts correctly as well as read values accurately from graphs. It is due to the enormous application of statistics and the unsatisfactory academic achievement of students in it, that the researcher focused on statistics. It is possible that students' academic achievement is unsatisfactory due to their challenge with statistics as it has been identified earlier that the knowledge of statistics is important in understanding certain areas in mathematics and is therefore crucial in students' overall academic achievement in mathematics.

Students' Academic Achievement in Mathematics

Academic achievement refers to the total quantitative or qualitative description of a learner's achievement after completing a course or level of instruction. Academic achievement relates to students' ability to recall and convey the knowledge or skill they have learned or studied orally or in writing in an examination or test (Verešová & Maláa, 2016). Academic achievement can also be seen as a student's capacity to achieve an academic goal (Wibrowski et al., 2017). More so, academic achievement refers to a system of measurement utilised in any educational institution to assess students academically. After the secondary school level of education, students sit for external examinations like WASSCE and their academic achievement in such examinations is a crucial determinant of future educational decisions and career path. A credit pass in five (5) subjects in one sitting is required for admission into tertiary institutions and mathematics is one of the core subjects which must be taken and passed as a benchmark for admission. Despite this, students' academic achievement in mathematics has been unsatisfactory. This could be attributed to topics like statistics which students have consecutively experienced weakness in. The unsatisfactory academic achievement of students' in statistics implies that most of the students possess minimum knowledge, skills and understanding of statistics and this plays a significant role in students' academic achievement in mathematics (Retutas & Rubio, 2021). Nevertheless, the reasons for students' unsatisfactory academic achievement have been of great concern in the past.

Past researchers investigated the cause of students' unsatisfactory achievement, keeping in mind that it is widely assumed that students' mental and cognitive abilities have no bearing on their academic achievement. According to Fong et al. (2017), a high degree of cognitive capacity does not imply a high level of academic accomplishment. Rather, a number of factors have been identified that may have an influence on students' academic achievement. The factors that may influence students' academic achievement include learning materials, learning facilities, class size and the classroom environment, finance (Mushtaq & Khan, 2012), and cross-factors related to students, teachers and schools (Kupari & Nissinen, 2013; Yang, 2013; Skouras, 2015; Tshabalala & Ncube, 2016). Past researchers have looked into students' unsatisfactory academic achievement with respect to the factors which strongly relate to tests and examinations. This is because students are expected to take a variety of examinations, including WASSCE after their secondary school education. As a result, students' academic achievement in such examinations is held in high regard, as it is a predictor of future educational development. The high importance and relevance of such tests causes a lot of anxiety in students (Adeleke, 2015).



Test Anxiety among Students

Test anxiety refers to a psychological condition that posits difficulty for students to concentrate, recall past knowledge and accurately write down what they have learnt. Test anxiety refers to a form of mental anxiety that revolves around testing situations, which may lead to worry about consequences of failure, negative thoughts, problem in recollecting facts, difficulty in reading and understanding questions (Balogun et al., 2017). Test anxiety refers to a psychological condition by which students experience different levels or degree of anxiety (low to extreme) before or during tests, and which may have an impact on their ability to produce their best work or obtain desired academic achievement due to pressure related to testing situations or expectancy (Akshaya et al., 2021). Test is an important part of education that determines students' level of learning and mastery of knowledge. Cherry (2020) outlined some factors that may trigger test anxiety, which include past history of poor testing outcome, being unprepared for test and fear of failure. This is evident in the fact that there is so much pressure on students to succeed and reach a high achievement, and this can lead to worry and as a result, have an impact on students' academic achievement (Shamsuddin et. al., 2013). This type of event may make the student to be more anxious in the future when taking tests. On the other hand, a bit of anxiety can be helpful in making students feel mentally alert and ready to tackle challenges presented in examinations or tests, due to the fact that an increased arousal level may help students to do better in examinations (Akshaya et al., 2021).

Test anxiety has both positive and negative effect on students' academic achievement. Nevertheless, there are different ways of identifying students who develop anxiety during tests. Symptoms which have been attributed to test anxiety include worry, fear of an approaching test, feeling inadequate or underestimating one's capacity to solve test (Owan, 2020), muscle tension, sweating, trembling, chest pain, heart palpitations, body shivers, weakness, irritable bowel, panic, high blood pressure, dry mouth, disorientation and memory loss, are among the other symptoms which may have an impact on students' lifestyle, professional development and academic progress (Ferreira et. al., 2014). Past researchers have probed into students' test anxiety in regard to students' academic achievement in the past. Some researchers stated that students' test anxiety had an influence on their academic achievement, while others stated that no relationship exists between the two variables. Barrows et al. (2013) stated that there is a relationship between test anxiety and students' achievement. A study by Mondal et al. (2013) revealed that students with high levels of test anxiety had lower academic accomplishment. Similarly, Von Der Embse and Witmer (2014) found that students with higher levels of test anxiety had poor test outcomes, whereas students with lower levels of test anxiety had better academic achievements. Furthermore, Hendy et al. (2014) found that test anxiety had an impact on students' achievement in mathematics. Chapman, (2013); Ndirangu et al. (2017); Fournier et al. (2017) on the other hand, reported that there is no relationship between test anxiety and students' academic achievement.

Self-efficacy among Students

Self-efficacy refers to a student's natural belief in his or her ability to persevere and succeed in any goal no matter how difficult or challenging it may be. According to Ansari and Khan (2015), self-efficacy refers to the belief an individual holds



regarding his or her capacity to influence situations, face challenges competently and make choices which affects every area of human endeavour. Penn and Lent (2018) stated that self-efficacy refers to the potentiality of individuals to make decisions and choices which enable them develop confidence in activities and accomplishments. Self-efficacy can also be seen as a unique ability which describes an individual's capacity to succeed or fail, attain goals and solve diverse problems (Odiri, 2020). The various meaning of self-efficacy shows that it defines the way an individual influences his or her ability to prosper and be confident in executing specific activities. These activities cut across various aspects including academics. Dogan (2015) further explained that self-efficacy is influenced by a person's belief in his or her ability to succeed and complete particular academic activities.

Therefore, self-efficacy beliefs can be narrowed down to relate to academic achievement by looking at the influence it has on an individual's academic activities. Despite the fact that self-efficacy represents a student's belief in being able to achieve a desired level of performance in academic tasks (Sharma & Nasa, 2014), students with a high level of intelligence may avoid tasks which they do not believe to accomplish successfully, and may willingly accept difficult tasks in areas where they have high levels of self-efficacy (Satici & Can, 2016). Therefore, a student's level of intelligence is not always directly proportional to the level of his or her self-efficacy. With respect to students' academic achievement in mathematics, self-efficacy has been linked to students' perseverance in relation to their academic activities (Tudy, 2014). This implies that in line with a subject like mathematics which involves tasks that may be challenging to students and require tenacity, self-efficacy may influence students' academic achievement.

Since self-efficacy may have an influence on students' academic achievement, it is imperative that the level of students' self-efficacy may consequently dispel or foster factors that affect their academic achievement. This implies that a high level of self-efficacy can increase a student's persistence and focus on a given knowledge or task beyond past levels of achievement in learning or participating in the task (Ormrod, 2016). This was further explained by Hendy et al. (2014), who stated that students with high levels of self-efficacy have more interest in attending classes, getting assignments done, studying and asking questions than students with lower levels of self-efficacy. In contrast to the previous report, Bandura (2013) stated that it is misleading to deduce that a student's result on a previous task can predict the result of a future task based on the student's self-efficacy as there are other factors like personal, behavioural and environmental factors that should be put into consideration. Therefore, the level of self-efficacy possessed by a student cannot always determine their academic outcome. Researchers have reported their findings based on the relationship between students' self-efficacy and their academic achievement. Ampofo (2019); Luttenberger et al. (2018) reported that in mathematics, students' self-efficacy fosters their actions and efforts in studying and thereby influence the belief they have in their ability to learn formulas and achieve better results academically. Wenty and Slamet (2019) reported that there is a relationship between students' self-efficacy and their achievement in Biology. More so, Oyuga et al. (2019); Ainscough et al. (2016); Roick and Ringeisen (2018) reported that self-efficacy has a relationship with students' achievement. In contrast to the previous findings, Karofi and Kasimu (2020)



reported that there is no relationship between students' self-efficacy and their academic achievement.

Gender of Students

Gender refers to a factor which determines the attribute of being a male or a female and which characterises an individual's unique behaviour. Gender refers to the unique sex roles of individuals (Kassaw & Astatke, 2017). In addition, gender denotes an individual's personal identity which defines the feelings and outward or physical appearance and mannerism of the individual (Forgasz & Leder, 2020). Gender also refers to the physical, biological and behavioural characteristics which are primarily based on the socio-cultural differences between males and females (Akinyemi & Ebimomi, 2020). Various studies have been done to determine the moderating influence of gender on students' academic achievement. Gender has been reported to have an influence on the academic achievement of students (Unodiaku, 2013; Salikutluk & Heyne, 2017). On the contrary, some studies (Khadijatu, 2017; Owan & Agunwa, 2019) reported that gender had no significant influence on students' academic achievement. In relation to the influence of gender on students' achievement in mathematics, Unodiaku (2013); Salikutluk and Heyne (2017) reported that male students achieved higher academically in mathematics than female students. Fisher et al. (2013) reported that female students achieved higher academically in mathematics than male students. Furthermore, other reports investigated the influence of gender on factors like test-anxiety and self-efficacy with respect to students' academic achievement.

Considering the influence of gender on students' test anxiety, past studies revealed contradictory findings. For instance, Guo et al. (2015); Ganley and Lubienski (2016); Rodríguez et al. (2020) reported that gender had an influence on students' test anxiety in relation to their academic achievement. Whereas, Puteh and Khalin (2016) and Owan (2020) reported that there is no significant influence of gender on students' test anxiety in relation to their academic achievement. Considering the influence of gender on students' self-efficacy, Rodríguez et al. (2020) reported that gender had an influence on students' self-efficacy in relation to their academic achievement. Whereas, Batiibwe et al. (2020) reported that there is no significant influence of gender on students' self-efficacy in relation to their academic achievement.

Therefore, there have been inconsistent and contradictory reports concerning the influence of gender in relation to test anxiety and self-efficacy on students' academic achievement. Although, gender has been suggested as a potential variable that may moderate the influence of test anxiety and self-efficacy on students' academic achievement, literature review in this area showed that the moderating role of gender on the relationship between test anxiety and self-efficacy on academic achievement has not been given adequate empirical attention in statistics. This gave rise to the need for this study which was carried out in order to put findings in perspective. Thus, this finding may also make a substantial contribution to the ongoing arguments in the literature especially on statistics. Furthermore, gender has also been identified to be a factor that may have a moderating influence on students' test anxiety, self-efficacy and academic achievement. Nevertheless, there have been conflicting reports on the moderating effect of gender on students' test anxiety, self-



efficacy and academic achievement in the past. As a result, no conclusion can be made, and this necessitated further investigation especially in statistics.

The findings of previous studies that attempted to investigate these components, test anxiety and self-efficacy as they relate to students' academic achievement have not been consistent. Some studies indicated that test anxiety and self-efficacy have a major impact on students' academic achievement, whereas others found no such influence. Furthermore, while some studies indicated that gender has a substantial impact on student test anxiety, self-efficacy and academic achievement, others found no such effect. Due to the contradictory findings described above, more research on the moderating influence of gender in relation to test anxiety and self-efficacy on students' academic achievement are needed. Therefore, this study seek to determine the moderating influence of gender in relation to test anxiety and self-efficacy on students' achievement in statistics. The following research questions guided this study;

- 1) What is the moderating influence of gender on the amount of variation in students' academic achievement in statistics that can be attributed to their test anxiety?
- 2) What is the moderating influence of gender on the amount of variation in students' academic achievement in statistics that can be attributed to their self-efficacy?

Hypotheses

H₀₁: There is no statistical significant moderating influence of gender on the amount of variation in students' academic achievement in statistics that can be attributed to their test anxiety.

H₀₂: There is no significant moderating influence of gender on the amount of variation in students' academic achievement in statistics that can be attributed to their self-efficacy.

Material and Methods

Participants and Setting

This study adopted a correlational research design. Correlational research design determines whether or not two variables change together as well as the degree of relationship that exists between the variables. This research design suits this study because it established the relationship that exists among test anxiety, self-efficacy (predictor variables) and academic achievement of secondary school students in statistics (criterion variable). This study was carried out in Nsukka Education Zone of Enugu State, Nigeria. The participants comprises 167 males and 195 females students. Multistage sampling procedure was used by the researcher. Multistage sampling procedure consists of more than two random sampling phases based on the hierarchical structure of clusters within a population. Three instruments used for data collection were Statistics Test Anxiety Inventory (STAI) adapted from Test Anxiety Inventory (TAI), Statistics Self-efficacy Scale (SSS) adapted from Mathematics Self-efficacy Scale and Statistics Achievement Test (SAT) developed by the researcher.

Statistics Test Anxiety Inventory (STAI) was designed to assess students' test anxiety in statistics. The responses of the students in STAI were scored on a 4-point scale options namely; strongly agree (SA) =4, agree (A) =3, disagree (D) =2 and



strongly disagree (SD) =1. STAI has two sections, A and B which were completed by the students. Section A required the students to specify their gender, while section B required the students to express the level to which they agree or disagree with the statements in the instrument. Statistics Self-efficacy Scale (SSS) was designed to assess students' self-efficacy in statistics. The responses of the students to SSS were scored on a 5-point scale options of; never true=1, rarely true=2, Neutral=3, sometimes true=4 and always true=5. The SSS has two sections, A and B which were completed by the students. Section A required the students to provide their gender, while section B required the students to express the level to which they agree or disagree with each of the statements. Statistics Achievement Test (SAT) consist of 30 multiple-choice items developed using a table of specifications from statistics as a theme in mathematics. The items have four (4) options with one option as the correct or right response. Each right response to an item was awarded one (1) mark to get a total of thirty (30) marks.

Validation of the Instruments

The STAI and SSS instruments were subjected to face validation. The instruments were given to validators for scrutiny. Copies of the instruments together with the title of the study, purpose of the study, research questions, hypotheses, marking guide, test blueprint were sent to the experts. Face validation was performed to check that the items were clearly expressed and unambiguous, that there were no spelling problems, that correct numbering was done and that no item was double-barreled. The corrections and inputs made by these validators were used to modify the items.

To determine the content validity of Statistics Achievement Test (SAT), the development of items was based on a table of specifications. SAT was constructed by the researcher using the topics in statistics; measures of central tendency (mean, median and mode), measures of dispersion (range, interquartile range, semi-interquartile range, variance and standard deviation), histograms, cumulative frequency graph and Probability. The weights for topic dimension were assigned based on the number of specific objectives set for each topic. The weights were gotten as follows, weight of the topic ($z\%$) = $\frac{x}{y} \times 100$. Where 'x' represents the number of specific objectives set for the topic and 'y' represents the total number of specific objectives in the topic. Similarly, the weights for the cognitive dimension ($z\%$) = $\frac{x}{y} \times 100$. Where 'x' represents the number of verbs peculiar to each of the cognitive level and 'y' represents the total number of specific objectives in the topic. Therefore, all the six levels of the cognitive domain of the modified Bloom's taxonomy of education were applied in the construction of the table of specification. These levels are: remembering, understanding, applying, analyzing, evaluating and creating.

To estimate the reliability of the instruments, the instruments were trial tested on a group of 30 students in a mixed public secondary school. The school had the same characteristics with the sampled schools. The data for the reliability estimation was collected using the various instruments. The Cronbach-alpha method of internal consistency reliability was used to obtain the reliability indices of the STAI and SSS instruments. The Cronbach-alpha method was used because it is the most suitable method of estimating internal consistency reliability for instruments that are polytomously scored. The reliability indices for STAI and SSS obtained were 0.86 and 0.69 respectively. The Kuder-Richardson 20 (KR-20) method of internal



consistency reliability was used to establish the reliability index of SAT. The items of the SAT instrument were dichotomously scored (i.e. with right/wrong responses); hence the KR-20 method was used because it is a very suitable method of reliability for such instrument. A reliability index of 0.94 was obtained for the SAT instrument.

Data Analysis

The data for this study was analyzed using regression analysis for research questions, (using Statistical Package for Social Science, SPSS version 23.0), and the t-value obtained from Hays Process Macro and the associated exact probability value was used to test hypotheses. Regression analysis was used because it is a statistical technique used for predicting the relationships between two or more variables. This technique was chosen because this study was carried out to find out the moderating influence of gender in relation to test anxiety and self- efficacy. The hypotheses were tested at 0.05 level of significance using t-value and the associated exact probability value was used to test the hypotheses. Process Macro was used to obtain the moderating influence of gender on the variables. The null hypothesis was rejected when the p-value was less than 0.05 level of significance; otherwise, the null hypothesis was not rejected.

Results

Table 1 shows the regression analysis for the moderating influence of gender on the amount of variation in secondary school students' academic achievement in statistics that can be attributed to their test anxiety. The result of the analysis revealed that the correlation coefficient between the variables is 0.14. This shows that there is a very low relationship between test anxiety and students' academic achievement in statistics as moderated by gender. The coefficient of determination, R^2 is 0.02. This implies that 2% of the amount of variation in students' academic achievement in statistics that can be attributed to their test anxiety is moderated by gender.

The result further revealed no significant moderating influence of gender on the amount of variation in secondary school students' academic achievement in statistics that can be attributed to their test anxiety. The result revealed that a t-value of -0.511 with associated exact probability value of 0.610 was obtained. Since, the exact probability value of 0.610 is greater than the set level of significance of 0.05, the null hypothesis is not rejected. Thus, inference is drawn that there is no statistical significant moderating influence of gender on the amount of variation in students' academic achievement in statistics that can be attributed to their test anxiety. Therefore, it is concluded that gender does not significantly moderate the prediction of test anxiety on the academic achievement of students in statistics.

Table 1. Moderating Influence of Gender on the Amount of Variation in Students' Academic Achievement in Statistics that can be attributed to their Test Anxiety

<i>Model</i>	<i>Interaction</i>	<i>R</i>	<i>R²</i>	<i>SE</i>	<i>t-value</i>	<i>LLCI</i>	<i>ULCI</i>	<i>P</i>
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1	Gender x	.135	.018	.127	-.511	-.315	.185	.610
Test anxiety								

Table 2 shows the regression analysis for the moderating influence of gender on the amount of variation in secondary school students' academic achievement in statistics that can be attributed to their self-efficacy. The result of the analysis revealed that the correlation coefficient between the variables is 0.14. This shows that there is a very low relationship between self-efficacy and students' academic achievement in statistics as moderated by gender. The coefficient of determination, R^2 is 0.02. This implies that 2% of the amount of variation in students' academic achievement in statistics that can be attributed to their self-efficacy is moderated by gender.

The result further shows no significant moderating influence of gender on the amount of variation in secondary school students' academic achievement in statistics that can be attributed to their self-efficacy. The result revealed that a t-value of 1.637 with associated exact probability value of 0.103 was obtained. Since, the exact probability value of 0.103 is greater than the set level of significance of 0.05, the null hypothesis is not rejected. Thus, inference drawn is that there is no statistical significant moderating influence of gender on the amount of variation in students' academic achievement in statistics that can be attributed to their self-efficacy. Therefore, it is concluded that gender does not significantly moderate the prediction of self-efficacy on the academic achievement of students in statistics.

Table 2. Moderating Influence of Gender on the Amount of Variation in Students' Academic Achievement in Statistics that can be attributed to their Self-efficacy

<i>Model</i>	<i>Interaction</i>	<i>R</i>	<i>R²</i>	<i>SE</i>	<i>t-value</i>	<i>LLCI</i>	<i>ULCI</i>	<i>P</i>
1	Gender x self-efficacy	.144	.021	.134	1.637	-.044	.482	.103

Discussion

Test Anxiety, Gender and Students' Academic Achievement in Statistics

We discovered that gender does not moderate the prediction of test anxiety on students' academic achievement in statistics. The findings also revealed that 2% of the amount of variation in students' academic achievement in statistics that is predicted by their test anxiety is moderated by gender. Further analysis for the equivalent hypothesis revealed no statistical significant moderating influence of gender on the amount of variation in students' academic achievement in statistics that can be attributed to their test anxiety. This implies that gender had no influence on the relationship between students' test anxiety and their academic achievement in statistics. This could be as a result of the fact that male and female students were equally involved during instruction and experienced the same level of test anxiety.

The finding of this study agrees with the findings of Kaur and Kaur (2019) who found out that there is no significant moderating influence of gender on the test anxiety of students with respect to their academic performance. Also, the finding agrees with that of Batiibwe et al. (2020) whose finding showed that there is no



moderating influence of gender on the anxiety of students with respect to their mathematics achievement. This agreement might be as a result of the fact that students had equal level of test anxiety irrespective of their gender. On the contrary, the finding disagrees with that of Akshaya et al. (2021) who stated that there is a significant difference between test anxiety and achievement of students as moderated by gender. This disagreement might be due to the geographical location of the study and the educational level of the students.

Self-efficacy, Gender and Students' Academic Achievement in Statistics

The findings further revealed that gender does not moderate the prediction of self-efficacy on students' academic achievement in statistics. The study also revealed that 2% of the amount of variation in students' academic achievement in statistics that is predicted by their self-efficacy is moderated by gender. Further analysis revealed no significant moderating influence of gender on the amount of variation in students' academic achievement in statistics that can be attributed to their self-efficacy. The finding of this study agrees with that of Kaur and Kaur (2019) whose finding showed that there is no significant moderating influence of gender on the self-efficacy of students with respect to their academic performance. Also, the finding agrees with that of Batiibwe et al. (2020) who stated that there is no moderating influence of gender on the self-efficacy of students with respect to their mathematics achievement. This agreement might be as a result of the fact that male and female students had the same level of self-efficacy. The finding disagrees with that of Barrows et al. (2013) who found out that there is a significant difference in male and female university students' examination scores with respect to their self-efficacy. This disagreement might be as a result of the level of education of the students.

Conclusions

There is no statistical significant moderating influence of gender on the amount of variation in students' academic achievement in statistics that can be attributed to their test anxiety. This means that there is no difference in the relationship between male and female students' test anxiety and academic achievement in statistics. Finally, there is no statistical significant moderating influence of gender on the amount of variation in students' academic achievement in statistics that can be attributed to their self-efficacy. This implies that there is no difference in the relationship between male and female students' self-efficacy and academic achievement in statistics.

Implications for Practitioners

This study places demand on parents to attend to students' educational needs equally, irrespective of students' gender. Parents are required to give equal preference to students with respect to encouragement and support so as to improve students' self-efficacy. More so, parents are urged to praise students' effort not ability so as to reduce their anxiety towards tests.

This study requires that teachers employ necessary measures in making use of effective procedures in reducing students' test anxiety and improving their self-efficacy. Teachers are thereby urged to find out the source and type of anxiety



students have. In addition, demand is placed on teachers to capitalise on students' interest, encourage students and give feedback, if students' academic achievements are to improve. Therefore, the attention of teachers and other bodies concerned in education are called to urgently seek for ways to improve the academic achievements of students.

Educational researchers are urged to develop functional methods to improve teaching and learning techniques effectively. These methods can provide adequate solutions to tackling test anxiety in students and provide strategies to improve students' self-efficacy. Instruments can thereby be developed to diagnose and solve the problem of test anxiety in students. Therefore, the findings of this study provide researchers with concrete evidence on the factors which need to be investigated to improve students' academic achievement.

Recommendations

1. Different seminars and lectures should be organised by school managements for students on how to reduce their test anxiety irrespective of their gender. Also, parents, counselors and teachers should pay equal attention to male and female students. This implies that there should be no discrimination of students as regards their gender when the issue of test anxiety is being considered because they all have predisposition to test anxiety.
2. Teachers should help students develop their self-efficacy irrespective of their gender. Literature on self-efficacy can provide suggestive insight on instructional strategies or interventions that can enhance male and female students' self-efficacy equally.

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