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# Impact of Statistics Anxiety and Self-efficacy on Statistical Performance of Psychology Students.

**Kalu Emmanuel Ogbonnaya**
Department of Industrial Mathematics and Applied Statistics,
Ebonyi State University, Abakaliki.

**Bernard Chibuike Okechi**
Department of Psychology, University of Nigeria, Nsukka.
**&**
**Benedict C. Nwankwo**
Department of Psychology and Sociological Studies,
Ebonyi State University, Abakaliki.
*Correspondence:* ogbonnaya_emmanuel@yahoo.com, kaluexcel01@gmail.com

**Abstract**
*Statistics anxiety is common among students of Psychology which has given rise to low performance of the students in Statistical courses. Students of Psychology experience statistics anxiety which is the feeling of worry whenever they encounter statistics. Low Self-efficacy is also considered to have impact on their performance in statistics. This study is aimed at investigating the impact of statistics anxiety, self-efficacy on statistical performance of psychology students in the Nigerian Universities. The study consisted of 230 Psychology undergraduate students from three Nigerian Universities including 108 males and 122 females and a mean age of 21.23 years. The Statistics Anxiety Rating Scale (STARS), General Self-efficacy Scale (GSS) and a Statistics Test was used to obtain the data for the study. The data was analyzed using Regression and Correlation analysis. The result revealed that Statistics anxiety and Self-efficacy impacted Statistics performance of psychology students, given statistical anxiety ($\beta$ = -0.20, $p<0.01$) and self-efficacy ($\beta$ = 0.78, $t$ = 3.78, $p<0.01$) with $R^2$=0.35. This study provided evidence to show the relationship between Statistics anxiety, Self-efficacy and Statistics performance. We recommend that teachers of statistics courses should help and build the students self-efficacy and reduce their anxiety toward statistics.*

***Keywords: statistics anxiety, self-efficacy, statistics performance, self-concept, statistics***

## Introduction

The study and application of statistics seems to have grown over the years which has increased the need for most undergraduate programmes to include it as one of their courses. The use of statistics in social sciences is vital because of its necessity in research design and analysis. The importance of statistics and research methods in the undergraduate Psychology degree programme has been acknowledged (Quality Assurance Agency for Higher Education, 2002;

British Psychological Society, 2006).Undergraduate students in most cases seem to accept that they feel uneasy to offer statistics course; they tend to believe that statistics is difficult to understand which has therefore given rise to the percentage of students affected by statistics anxiety. Statistics anxiety is a widespread problem amongst social sciences students: 80 percent of graduate students experience statistics anxiety (Macher et al, 2013; Onwuegbuzie, 2004). A large proportion of students identify statistics courses as the most anxiety-inducing courses in their curriculum (Zeidner, 1991). Especially in subjects such as psychology, education, or sociology, statistics anxiety is widely spread among students (Onwuegbuzie & Wilson, 2003; Onwuegbuzie, 2004; Ruggeri et al, 2008).

Statistics anxiety describes the apprehension that an individual experiences in instructional situations, in evaluative contexts related to statistics, or when working on statistical tasks. It is an enduring, habitual type of anxiety (Onwuegbuzie & Daley, 1999; Onwuegbuzie, 2004).Statistics anxiety is a pervasive problem in the context of university studies, especially in social science degrees, such as psychology, education, or sociology (Onwuegbuzie and Wilson, 2003; Ruggeri et al, 2008).

Statistics anxiety can affect the student's statistics performance and also the student's overall academic performance. Students who experience test anxiety are likely to have lower overall academic results compared to students who experience no test anxiety (Eum & Rice, 2011). Students that experience test anxiety are not only more likely to have lower grades, but are also more likely to drop out of their studies or take longer to graduate (Macher et al., 2013). Statistics anxiety has been linked to students' performance in statistics and research courses (Lalonde and Gardner, 1993; Onwuegbuzie and Seaman, 1995, Zanakis and Valenza, 1997), and has been recognized as a deterrent to students' finishing their degrees (Onwuegbuzie, 1997).

There are other factors that affect students' performance in statistics which also impacts on their anxiety towards statistics course. One of these factors includes self-efficacy. Self-efficacy is one of the factors that influence statistics anxiety amongst students (Perepiczka, Chandler, & Becerra, 2011).Self-efficacy is the belief we have in our own abilities, specifically our ability to meet the challenges ahead of us and complete a task successfully (Akhtar, 2008). General self-efficacy refers to our overall belief in our ability to succeed, but there are many more specific

forms of self-efficacy as well which include academic, parenting, sports (Courtney, 2018). Self - efficacy has been defined as the self-beliefs students hold about their ability to complete specific tasks or actions successfully (Bandura, 1997). Self-efficacy could also be described as how someone perceives his or her own abilities. More specifically for statistics, that would be how students perceive their own abilities to be able to deal with statistical tasks, and how students perceive their ability to learn the necessary skills to deal with these tasks (Finney & Schraw, 2003). Self-efficacy also seem to impact on students' performance in statistics. The students tend to discuss it as a difficult course to offer in their curriculum. This level of self-efficacy seems to lead to statistics anxiety which will in turn impact their statistics performance.

Students' anxiety towards courses seems to be understandable due to some reason associated to the course or the environment of learning. Some Psychology students in their undergraduate studies tend to show unreserved anxiety towards statistics courses which seem to affect their overall academic performance. Students who experience test anxiety are likely to have lower overall academic results compared to students who experience no test anxiety (Eum & Rice, 2011). When it comes to the subject of statistics, this problem is especially pronounced (Vink, 2017).

Self-efficacy also is one of the factors that affect the statistics performance of undergraduate students. However, many graduate students seem to struggle with statistics courses because they do not have the personal self-efficacy to perform at the required level; and, this may delay their progress in statistics coursework (Schneider, 2011). Self-efficacy beliefs play a major role in a student's confidence in the ability to complete advanced research (Unrau & Beck, 2004).

Therefore, we seek to find the impact of statistics anxiety and self-efficacy on statistics performance as related to psychology undergraduate students. Thus, the objective of this study;

1. To examine the Impact of statistics anxiety on statistical performance of students.
2. To examine the Impact of self-efficacy on statistical performance of students.
3. To examine the Relationship between statistics anxiety, self-efficacy and statistical performance of students

Few theories were discussed to back up the study and empirical studies were also indicated to support the study.

**Social Cognitive Theory**

Social Cognitive Theory (SCT) started as the Social Learning Theory (SLT) in the 1960s by Albert Bandura. It developed into the SCT in 1986 and posits that learning occurs in a social context with a dynamic and reciprocal interaction of the person, environment, and behavior. The unique feature of SCT is the emphasis on social influence and its emphasis on external and internal social reinforcement. SCT considers the unique way in which individuals acquire and maintain behavior, while also considering the social environment in which individuals perform the behavior. The theory takes into account a person's past experiences, which factor into whether behavioral action will occur. These past experiences influence reinforcements, expectations, and expectancies, all of which shape whether a person will engage in a specific behavior and the reasons why a person engages in that behavior (LaMorte, 2018).

The relationship between behavioral, personal, and environmental factors is termed triadic reciprocal causation. It is believed that any of the factors that comprise the triad can be altered through varied teaching methods, support systems, and counseling services (Pajares, 2002).

**Self-efficacy Theory**

Bandura (1994) explained Perceived self-efficacy as people's beliefs about their capabilities to produce designated levels of performance that exercise influence over events that affect their lives. Self-efficacy beliefs determine how people feel, think, motivate themselves and behave. Such beliefs produce these diverse effects through four major processes. They include cognitive, motivational, affective and selection processes.

Bandura further explained that, strong sense of efficacy enhances human accomplishment and personal well-being in many ways. People with high assurance in their capabilities approach difficult tasks as challenges to be mastered rather than as threats to be avoided. Such an efficacious outlook fosters intrinsic interest and deep engrossment in activities. They set themselves challenging goals and maintain strong commitment to them. They heighten and sustain their efforts in the face of failure. They quickly recover their sense of efficacy after failures or setbacks. They attribute failure to insufficient effort or deficient knowledge and skills which are acquirable. They approach threatening situations with assurance that they can exercise

control over them. Such an efficacious outlook produces personal accomplishments, reduces stress and lowers vulnerability to depression (Bandura, 1994).

**Statistics Anxiety and Statistical Performance**

Statistics anxiety not only influences performance in an examination but also during the preparation phase. In the examination, statistics anxiety is related to interference of task-relevant with task-irrelevant thoughts (Eysenck, M. W., Derakshan, N., Santos, R., and Calvos, M. G., 2007), such as worry and rumination, and reduces cognitive resources that are necessary for task solving. Macher et al. (2013), in their study assessed students statistics anxiety two (2) weeks prior to the examination. They also assessed their feelings of state anxiety at two points during the examination. Statistics anxiety instilled a high level of state anxiety at the beginning of the examination and was to a large degree responsible for the maintenance of a high anxiety level, which impaired academic performance.

Previous research has shown statistics anxiety to be negatively related to statistical performance (Keeley, J., Zayac, R., & Correia, C., 2008; Macher, D., Paechter, M., Papousek, I., & Ruggeri, K., 2012; Macher et al., 2013; Macher, D., Papousek, I., Ruggeri, K., & Paechter, M., 2015). Therefore, it was hypothesized that a higher level of statistics anxiety is associated with a lower statistics examination result (Keeley, et al., 2008; Macher et al., 2012; Macher et al., 2013; Macher et al., 2015).

**Self-efficacy and Statistics Performance**

Research shows that there is an assumption that the beliefs that young individuals hold about their capacity to be successful in their undertakings are significant factors in subsequent successes or failures they achieve within their endeavors (Pajares, 2005).

Refugio (2018) in his research found a good level of performance in basic statistics and a strong extent of agreement on: the sources of self-efficacy beliefs; levels of self-efficacy beliefs; and behavior patterns based on the self-efficacy beliefs. Lane and Lane (2001) found that self-efficacy predicted performance among postgraduate students. They developed a self-efficacy measure by asking lecturers who taught on the module and students studying on the module to list competencies they believed would be needed to achieve success. They found that having the

intellectual ability to cope with course content, and being able to manage time were the most important competencies.

Therefore, this study is aimed at investigating the impact of Statistics Anxiety and Self-efficacy on Statistical Performance as related to psychology undergraduate students.

Theoretical Frame work: Self-efficacy theory was adopted as the theoretical frame work of this study due to its contributions to human accomplishment and personal wellbeing.

**Hypotheses**

1. Statistics anxiety will not have significant impact on statistical performance of psychology students.
2. Self-efficacy will not have significant impact on statistical performance of psychology students.
3. There will be no relationship between Statistics anxiety, Self-efficacy and Statistical performance of psychology students.

**Method**

***Participants***

The study consists of two hundred and thirty (230) participants from the department of psychology from three Nigerian universities. Eighty six (86) participants were drawn from Ebonyi State University, Abakaliki, seventy eight (78) participants drawn from University of Nigeria, Nsukka, and sixty six (66) participants drawn from Nnamdi Azikiwe University, Awka. One hundred and eight (108) were males while one hundred and twenty two (122) were females. The age range was 18 – 25 (Mean=21, SD=2.34).

***Measures***

Statistical Anxiety was measured using the Statistical Anxiety Rating Scale or STARS developed by Cruise, R. J., Cash, R. W., & Bolton, D. L. (1985). It was a self-administered questionnaire which utilized principal components analysis to identify six components of statistics anxiety

which the STARS purports to measure; these are: worth of statistics, interpretation anxiety, test and class anxiety, computational self-concept, fear of asking for help and fear of statistics teachers. It consists of 51 items with a scoring pattern of 1 = no anxiety, 5 = strong anxiety in each of the situations for the first 23 items and then the participants were asked their level of agreement from 1 = strongly disagree to 5 = strongly agree on the remaining 28 items. Higher scores on an item or subscale indicate higher levels of that attitude or anxiety. Each of the six subscales purports to measure a different aspect of statistical anxiety. These scales demonstrated 5-week test–retest reliabilities between .67 and .83 (Cruise et al., 1985). The questions 24, 26, 27, 28, 29, 33, 35, 36, 37, 40, 41, 42, 45, 47, 49, 50 are 'worth of statistics' subscale which attempts to measure the perceived usefulness of statistics. The questions 2, 5, 6, 7, 9, 11, 12, 14, 17, 18, 20 are 'interpretation anxiety' subscale which attempts to measure anxiety when interpreting statistical results. The questions 1, 4, 8, 10, 13, 15, 21, 22 are 'Test and class anxiety' subscale designed to assess the anxiety experienced when taking a statistics test or attending a statistics class. The questions 25, 31, 34, 38, 39, 48, 51 are 'computation self-concept' subscale which is related to a person's self-belief in their ability to cope with the calculations and mathematics related to statistics. The questions 3, 16, 19, 23are 'ask for help' subscale which attempts to assess the anxiety experienced when an individual intends to ask for help on a statistical problem. The questions 30, 32, 43, 44, 46, are 'fear of statistics teachers' subscale, claims to measure students' perceptions of their statistic teachers. It is currently the most widely used measure for assessing statistics anxiety (Onwuegbuzie & Wilson, 2003). The high internal consistency of the total 51 item scale reported by Onwuegbuzie (1993) and Baloglu (2002), both reported $\alpha = 0.96$, which suggests that STARS is a uni-dimensional scale.

Self-Efficacy was measured using the General Self-Efficacy (GSE) Scale developed by Schwarzer and Jerusalem in 1995 and has been cited in hundreds of articles. These researchers are known to be the leading experts in self-efficacy. This scale is a self-report measure of self-efficacy which consists of 10 items rated on a scale from 1 (Not true at all) to 4 (Exactly true).The total score is calculated by finding the sum of the all items. For the GSE, the total score ranges between 10 and 40, with a higher score indicating high self-efficacy. The Internal reliability for GSE is Cronbach's alphas between .76 and .90. The General Self-Efficacy Scale is

correlated to emotion, optimism, and work satisfaction. Negative coefficients were found for depression, stress, health complaints, burnout, and anxiety (Schwarzer & Jerusalem, 1995).

A Statistics Quiz of 12 questions was developed based on basic statistics and statistics reasoning. It was used to evaluate the statistics performance of the students. The students' scores ranges from 0 – 100 percent. The test was standardized by measuring the test difficulty and discrimination of the quiz. Fifty (50) Psychology students in 400 level from Ebonyi State University, Abakaliki was sampled. The result of the test difficulty gave a range of 50 - 75 index which suggested medium difficulty while the test discrimination of all the questions were greater than 0.3 which suggested a good discrimination index. Therefore, the test was considered valid for the research.

***Procedure***

The participants of the study were undergraduate students of psychology department in 400 level in the Universities sampled. The instrument was administered to the students after a departmental course in each of the university. The researcher first explained the reason for the research and the method of filling the questionnaire. An allocated time of 20 minutes was given to the participants to answer the statistics test questions. The procedure used in sampling the questionnaire and answering the statistics test questions was the same in the three universities which is simple random sampling of odd numbers using the students registration number. A total of 250 copies of questionnaires were distributed to the participants, 20 copies were wrongly filled and were discarded while 230 copies were used for analysis.

***Analysis***

For the data analysis, the data collected was analyzed using regression to evaluate the impact of statistics anxiety and self-efficacy on statistical performance. Correlation analysis was used to find the relationship between the three variables.

**Results**

Table 1: Descriptive statistics for the variables

| | N | Mean | SD | Min | Max |
|---|---|---|---|---|---|
| Gender | 230 | - | - | - | - |
| Male | 108 | - | - | - | - |
| Female | 122 | - | - | - | - |
| Age | 230 | 21 | 2.34 | 18 | 25 |
| Statistical Performance | 230 | 44.64 | 27.83 | 10 | 98 |
| Statistics anxiety | 230 | 156.49 | 58.42 | 55 | 251 |
| General Self-Efficacy | 230 | 24.89 | 8.76 | 10 | 40 |

The table 1 above shows the descriptive statistics of the variable gotten from the study. It shows the demographic data and the descriptive result of the scales used in the research study.

Table 2: The Regression result of the impact of Statistics Anxiety towards Statistical Performance

| | B | SE | t | |
|---|---|---|---|---|
| Constant | 86.04** | 4.38 | 19.64 | |
| Statistics anxiety | -0.27** | 0.3 | -10.03 | |
| $R^2$ | | | | 0.308 |
| Adjusted $R^2$ | | | | 0.305 |
| F | | | | 101.66** |

Note: ** significant at p<0.01

The regression analysis was performed to analyze the impact of Statistics Anxiety towards Statistical Performance. The result showed that statistics anxiety is significantly negatively related to statistical performance ($\beta$ = -0.27, t = -10.03, p<0.01). Statistics anxiety account for 31% of variance in statistics performance ($R^2$ = 0.31). Since the result showed a significant impact, we therefore, reject the null hypothesis which states that statistics anxiety will not significantly impact on statistical performance of students.

Table 3: *The Multiple Regression result of the impact of Statistical Anxiety Subscales and Self-Efficacy towards Statistical Performance*

| | B | SE | t | |
|---|---|---|---|---|
| Constant | 67.41 | 6.14 | 8.24 | |
| Worth | -0.50** | 0.23 | -5.63 | |
| Interpretation | -0.38** | 0.41 | -4.82 | |
| Test | -0.06 | 0.33 | -3.67 | |
| Self-Concept | -0.24* | 0.64 | -2.45 | |
| Ask for Help | -0.08 | 0.51 | -2.85 | |
| Fear of the Teacher | -0.37** | 0.84 | -5.23 | |
| $R^2$ | | | | 0.44 |
| Adjusted $R^2$ | | | | 0.41 |
| F | | | | 89.94** |

Note: ** significant at p<0.01, * significant at p<0.05

The regression table above shows the impact of the subscales in the STARS Questionnaire. It shows that "Worth of Statistics" (β = -0.50, t = -5.63, p<0.01), "Interpretation Anxiety" (β = -0.38, t = -4.82, p<0.01), "Self-Concept" (β = -0.24, t = -2.45, p<0.05), and "Fear of the Teacher" (β = -0.37, t = -5.23, p<0.01) were statistically significant while "Test and Class Anxiety" (β = -0.06, t = -3.67), and "Ask for Help" (β = -0.08, t = -2.85) were not significant.

Table 4:*The Regression result of the role of Self-Efficacy towards Statistical Performance*

| | β | SE | t | |
|---|---|---|---|---|
| Constant | 6.74 | 4.87 | 1.38 | |
| General Self-Efficacy | 1.52** | 0.19 | 8.25 | |
| $R^2$ | | | | 0.230 |
| Adjusted $R^2$ | | | | 0.227 |
| F | | | | 68.06** |

Note: ** significant at p<0.01

The regression analysis result was done to investigate the impact of self-efficacy on statistical performance of psychology students. The result of the analysis showed that self-efficacy has a significantly positive impact on statistical performance ($\beta = 1.52$, $t = 8.25$, $p<0.01$). Self-efficacy account for 23% of variance in statistical performance ($R^2 = 0.23$). Given a statistical significant effect, we reject the null hypothesis which states that Self-efficacy will not have significant impact on students' statistical performance.

Table 5:*The Multiple Regression result of the impact of Statistical Anxiety and Self-Efficacy on Statistical Performance*

| | B | SE | t | |
|---|---|---|---|---|
| Constant | 56.44** | 8.91 | 6.34 | |
| Statistics Anxiety | -0.20** | 0.03 | -6.46 | |
| General Self-Efficacy | 0.78** | 0.21 | 3.78 | |
| $R^2$ | | | | 0.35 |
| Adjusted $R^2$ | | | | 0.34 |
| F | | | | 60.94** |

Note: ** significant at $p<0.01$

The regression analysis was performed to analyze the impact of Statistics Anxiety and Self-efficacy on Statistical Performance. The result showed that statistics anxiety is significantly negatively related to statistical performance ($\beta = -0.20$, $t = -6.46$, $p<0.01$). The result of the analysis also showed that self-efficacy has a significantly positive impact towards statistical performance ($\beta = 0.78$, $t = 3.78$, $p<0.01$). Statistics anxiety and Self-efficacy both account for 35% of variance in statistical performance ($R^2 = 0.35$).

Table 6: *The Pearson Correlation Analysis result of the relationship between Statistics anxiety, Self-efficacy and Statistical performance*

| | 1 | 2 |
|---|---|---|
| Statistical Performance | | |
| Statistics Anxiety | -.555** | |
| General Self-Efficacy | .479** | -.562** |

Note: ** significant at p<0.01

The Pearson correlation analysis was done to obtain the relationship between statistics anxiety, self-efficacy and statistical performance. The result of the analysis showed that there is a significant relationship between the three variables. Statistical anxiety showed a negative relationship with statistical performance (r = -.555), and also a negative relationship with self-efficacy (r = -.562) while self-efficacy showed a positive relationship with statistical performance (r = 0.48). Given a statistical significant relationship, we then reject the null hypothesis which states that there will be no relationship between Statistics anxiety, Self-efficacy and Statistical performance.

**Discussion**

This study aimed at investigating the impact of statistics anxiety and self-efficacy on statistical performance; and the relationship that exist between statistical anxiety, self-efficacy and statistical performance of psychology students. The analysis showed that statistical anxiety significantly negatively impacted statistical performance. This indicates that students with high statistical anxiety perform poorly in statistics tests. The result of the STARS subscales shows the most perceived statistical anxiety of the students'. Worth of Statistics, Interpretation Anxiety, Self-concept and Fear of the Teacher reported a significant factor. The result of this analysis aligned with results of previous researches which hypothesized that a higher level of statistics anxiety is associated with a lower statistics performance in examinations (Keeley, et al., 2008; Macher et al., 2012; Macher et al., 2013; Macher et al., 2015). Paecher et al (2017) found a marginally significant negative relationship between statistics anxiety and statistics performance. But the researches done by Vink (2017); Chiesi and Primi (2010); and Nascxser (2004) was not

able to find a statistical significant relationship between statistical anxiety and statistical performance. Hence this discrepancy was resolved by the result of this study.

The result of the analysis showed that self-efficacy significantly positively influence statistical performance. This means that students with high self-efficacy tend to perform better in statistics examinations than their low self-efficacy counterparts. The result of this analysis supports the work of Refugio (2018) who found a significant positive large size and a positive high extent of multiple correlations between self-efficacy and statistical performance. Previous researches from Baloğlu (2003); Chiesi and Priemi (2010); and Perepiczka et al. (2011) showed that self-efficacy is negatively related to statistics anxiety which means that a low self-efficacy will cause an increase in statistics anxiety. However, high level of statistics anxiety leads to poor performance in statistics examinations.

We also found a significant relationship between statistics anxiety, self-efficacy and statistics performance. This indicates that some percentage of the students' performance in statistics can be accounted by statistics anxiety and self-efficacy. Research by Perepiczka et al (2011) found that students who believe they have poor statistical abilities, experience more statistics anxiety. Research by Vink stated that statistics anxiety seems to be related to performance and has important implications for educational practice, which means this study has given some insight into a topic with important educational implications. In light of future interventions regarding statistics anxiety, its relation with self-efficacy should be taken in mind (Vink, 2017).

**Conclusion**

In conclusion, this study was able to present evidence that statistics anxiety, self-efficacy and statistical performance of students are related. With this established relationship, it is of great importance that students should possess a high level of self-efficacy in other to reduce statistics anxiety. The performance of students in any course is in no doubt also related to some other factors which includes, procrastination, lack of motivation, perception, and lack of previous knowledge but self-efficacy and anxiety can also account for a reasonable percentage. When students judge their chances for success positively they are more willing to invest effort and

time. Similarly, students with a positive self-efficacy in statistics rate their chances to succeed positively and are more likely to exhibit effective learning behaviors (Macher et al, 2015).

We suggest that further studies should consider Big Five Personality traits, Locus of Control, Assertiveness, and Students' Stress Coping Strategy as predictors of Statistics performance. This is to discover whether these behavioural traits impacts positively or negatively towards the learning and study of statistics courses.

Therefore, we recommend that teachers of statistics courses should help and build the students self-efficacy toward statistics. They should encourage the students to reduce their anxiety towards statistics examinations. Counseling sections should be organized, which will center on research and analysis, to help the students understand the importance of statistics in psychology.

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