



Journal Homepage: -www.journalijar.com

INTERNATIONAL JOURNAL OF ADVANCED RESEARCH (IJAR)

Article DOI:10.21474/IJAR01/13630
DOI URL: <http://dx.doi.org/10.21474/IJAR01/13630>



RESEARCH ARTICLE

Comparative Study of the Attitudes of Science and Non-Science Students towards Statistics: The Role of Statistic Anxiety

Sunday G. Adeniyi

Department of Mathematics Kogi State College of Education, Ankpa.

Manuscript Info

Manuscript History

Received: 31 August 2021

Final Accepted: 30 September 2021

Published: October 2021

Key words: -

Science, Non-Science, Statistics,
Attitude, Anxiety

Abstract

Statistics is an essential part of the curriculum in Nigeria's education landscape taught in the science and non-science classrooms. However, there has been a growing concern about the student's attitudes towards statistics across every level. The present study aimed to determine whether there would be a difference between science and non-science students' attitudes towards statistics and whether statistics anxiety contributes to the variations in students' attitudes towards statistics in the tertiary education level in Nigeria. A convenience sample of two hundred and twenty-two first-year students pooled from three public tertiary institutions in the Kogi State of Nigeria participated in the study. A cross-sectional survey design was adopted. The participants completed a self-report measure of Survey of Attitude toward Statistics (SATS-36), initially developed by Schau (2003), and a modified version of the Statistics Anxiety Rating Scale (SARS) developed initially by Baloğlu (2002). An independent t-test performed on the data established a statistically significant difference in the attitudes of the science and non-science students towards statistics at $MD = 1.78$, $t(200) = 13.632$, $P < .05$. The result of a regression analysis performed on the data revealed that statistics anxiety positively predicted attitudes towards anxiety. It was concluded that the variation between the attitude of science students and non-science students towards the teaching and learning of statistics is moderated by statistics anxiety. The study recommends that robust attitude change strategies be adopted to reshape the attitudes of the non-science students towards statistics.

Copy Right, IJAR, 2021, All rights reserved.

Introduction:-

Statistics represents one of the essential subjects in the school curriculum in contemporary society (Eichler & Zapata-Cardona, 2016). Statistics denotes the science of learning from data (Lieten, 2005). Statistical methods are crucial to the quality and rigor of any scientific endeavour (Annapurna, 2017; Olivier & Bell, 2018). Statistics has emerged as a distinct discipline (Garfield & Ben-Zvi, 2007; Groth, 2015; Jose, 2017). Statistics play a crucial role in society and the workplace and have received increased attention from scholars (Ben-Zvi & Garfield, 2008; Chew & Dillon, 2014; Sharma, 2017). Perhaps, attention has been directed to the method of teaching and learning statistics in many countries (Fioravanti Pereira et al., 2019; Veloo et al., 2018). The importance of statistics has been widely highlighted (Frost, 2017; Gupta & V., 2020; Wiberg, 2009). For example, researchers have emphasized the relevance of statistics in psychology (Verma & Verma, 2019), health research (Coggon, 2015), national

Corresponding Author:- Sunday G. Adeniyi

Address:- Department of Mathematics Kogi State College of Education, Ankpa.

development (Shangodoyin & Lasisi, 2011), biophysical context (Tamm, 2019), data mining (Ribeiro et al., 2017). Statistics is an essential component in scientific discoveries, decision-making, and predictions based on data (Lieten, 2005). There are many common misapprehensions about statistics (Currey et al., 2009). Statistics has been widely perceived as a challenging course, and this has presented a significant challenge for higher education students and is consequently associated with anxiety, which further inhibits performance (Sandoz et al., 2017). Research has attested that students commonly have negative perceptions of learning statistics (Gopal et al., 2020).

Statistics is usually a service course to students in non-science departments such as management and social sciences in the Nigerian tertiary education system. Basic statistical knowledge such as data representation, data distribution, probability, sampling, and statistical inferences is required to study most courses, including science, engineering, business, humanities, education, and others. Consequently, most students enrolled in non-science classes do not necessarily have a solid mathematical background (Dempster & McCorry, 2009). Accordingly, Lavldas et al. (2020) had reported the effect of perceived competence in mathematics on students' performance in the statistics course. The unsatisfactory perception of students in statistics is well documented (Field, 2002; Murtonen & Lehtinen, 2003), and the trend is experienced globally. Many non-statistics students most often do not see the relevance of statistics within their discipline (Bilgin et al., 2020).

There is a growing concern about the emotional states of many students at the introduction of statistics. The construct of statistics anxiety reflects the apprehension that accompanies exposure to statistical content or problems and instructional situations or evaluative contexts that deal with statistics (Macher et al., 2015). Accordingly, Baloglu and Zelhart (2003) contend that the phenomenon is a multidimensional construct that comprises anxieties related to the interpretation, assessments, computation, help-seeking, and statistics instructors' phobia. Nevertheless, statistics anxiety could be a determining factor in many students' perceptions of the courses in higher education. Perhaps, it might influence course participation. However, intimation suggests that the trend is prevalent among the freshmen. Perhaps, the new students might approach the course with preconceived thoughts and attitudes, increasing or decreasing their anxiety towards statistics (Koh & Zawi, 2014). However, students' statistical anxieties have attracted broad investigation in recent years (Cui et al., 2019; Faber & Drexler, 2019; Huang, 2018; Malik, 2015; Najmi et al., 2018; Onwuegbuzie, 2004; Siew et al., 2019; Smith & Capuzzi, 2019; Tonsing, 2018; Vahedi et al., 2012; Walsh & Ugumba-Agwunobi, 2002; Williams, 2010). This study is concerned with the variation in attitude to statistics in undergraduates from science and non-science backgrounds.

Attitudes are a psychological construct that reflects an individual's learned disposition to behave in a consistent evaluative manner towards any aspect of their environment. The term symbolizes favourable or unfavourable evaluation of attitude objects. Thus, attitude, when acquired, can influence individual's responses to their environments. Students with a positive attitude tend to be more diligent in learning, whereas a negative attitude is characterized by a reduced commitment (Kurniawan et al., 2019). Over the years, attitude towards statistics has received increased attention, especially as it relates to performance (Arumugam, 2014; Ashaari et al., 2011; Budé et al., 2012; Gerald & Allan, 2018; Gómez et al., 2012; Judi et al., 2011; Koparan & Güven, 2008; Mustam et al., 2020; Nguyen et al., 2016; Saidi & Siew, 2018). Performance in statistics assessments is clearly shown to be related to students' attitudes toward statistics (Dempster & McCorry, 2009; Rosli & Maat, 2017).

Study major has been implicated in the student-statistics relationship. Thus, students enrolled in various academic disciplines have a different perception of statistics as a course. Perhaps, science-oriented students could have a more positive attitude towards statistics when compared to their counterparts in non-science fields. However, insinuations suggest that the variation in attitudes towards statistics between the science and non-science students could be attributed to statistic anxiety. Thus, the primary purpose of the present study is to provide answers to the following questions:

1. Would there be a significant difference between science and non-science student's attitudes towards statistics?
2. Does statistic anxiety predict the variation between science and non-science student's attitudes towards statistics?

Hypothesis

Two hypotheses were formulated to guide the present study;

- a. There would be a significant difference between science and non-science student's attitudes towards statistics.
- b. Statistics anxiety would significantly predict the variation between science and non-science student's attitudes towards statistics.

Method:-

The present research was conducted in Kogi State, Nigeria, between July and September 2021. A convenience sample of two hundred and twenty-two ($n = 222$) first-year undergraduates comprising males and females enrolled in science and non-science courses were chosen from different faculties in three public tertiary institutions in the state. The students were approached with the help of research assistants and asked to participate in the study. Those who consented and passed the inclusion criteria were briefed on the study's purposes. Also, all ethical considerations were observed. After that, the study instruments were given to them to fill on the spot. A cross-sectional research design was adopted in the study.

Measures:-

Attitude towards statistics was measured using the Survey of Attitude toward Statistics (SATS-36) initially developed by Schau (2003). The 36 items, Linkert-type scale is scored in a 7- point format ranging from (1) strongly disagree to (7) strongly agree. Items in the scale were modified to suit the present context. Cronbach alpha .78 was recorded in this study.

Statistics anxiety was assessed with a modified version of the Statistics Anxiety Rating Scale (SARS) developed initially by Baloglu (2002). The initial 51 items scale was revised to 21 items to fit the current research context. The Linkert type scale rated on a 5-point scale measures statistics anxiety with six subscales, including the worth of statistics, class anxieties, interpretation anxiety, computational self-concept, fear of seeking help, and instructor fear. A higher score indicates a higher statistics anxiety. A Cronbach alpha .78 was recorded in the present study.

Result:-

Table 1 below indicates that a mean score of ($M = 2.04$) and standard deviation score of ($SD = 3.09$) was recorded for the science students. In contrast, a mean score of ($M = 0.26$) and standard deviation score of ($SD = 2.41$) was recorded for the non-science students. This score reveals that the science students showed a more positive attitude towards statistics when compared to their non-science counterparts.

Table 1:- Table showing the mean and standard deviation scores of the science and non-science student attitude towards statistics.

Study major	N	Mean	SD
Science	113	2.04	3.09
Non-science	109	0.26	2.41
MD		1.78	

An independent-samples t-test was conducted to test the study's first hypothesis, which stated that there would be a significant difference between science students and non-science students on attitude towards statistics. The result established a statistically significant difference between science and non-science students on attitude towards statistics at $MD = 1.78$, $t(200) = 13.632$, $P < .05$.

Table 2:- Table showing t-test comparison of the difference between science and non-science students on attitude towards statistics.

Source of Variation	Mean	SD	df	t	Sig
Science	2.04	3.09			
Non-science	0.26	2.41	200	13.632	.000

A simple regression analysis was performed to test the second hypothesis, which assumed that statistics anxiety would significantly predict the variation between science and non-science student's attitudes towards statistics. The analysis revealed that statistics anxiety significantly predicted the variation between science and non-science student's attitudes towards statistics $F(1,200), 60.035$, $P < .000$. With adjusted R^2 indicating that the predictor variable accounted for 48.6% of the variation between science and non-science student's attitudes towards statistics

Table 3:- Table showing linear regression results for between science and non-science students on attitude towards statistics.

	B	SEB	β	R^2	t	Sig
Constant	2.47	.133			18.678	.000
Statistics Anxiety	-.476	.061	-.567	.486	-8.730	.000

Discussion:-

The current study was conducted to determine whether there would be a difference between science and non-science student's attitudes towards statistics. It was expected that the science students would have a more positive attitude towards statistics than the non-science students. Indeed, the independent t-test performed on the data established a statistically significant difference in the attitudes of the science and non-science students towards statistics at MD = 1.78, $t(200) = 13.632$, $p < .05$. This means that the expectation of the study was affirmed. The study results indicate that students enrolled in science courses such as engineering, health sciences, and natural and physical sciences are more likely to perform better in statistics than those in non-science departments such as management and social sciences. The finding is aligned with a previous study (Cahyawati et al., 2018; Griffith et al., 2012). For instance, (Cahyawati et al., 2018) reported a higher mean score for science field students and a lower mean score for social field students on attitude towards statistics.

More so, it was assumed that the variation in attitude towards statistics could be predicted by statistics anxiety. Thus, the result of the simple regression analysis confirmed that statistic anxiety significantly predicted attitude towards statistics. Hence, the observed variation in the attitudes to statistics between the science and non-science students could be attributed to statistics anxiety. As such, science students are more exposed to calculation courses and analytical concepts. Thus, they are less likely to experience statistics-related worries. Science disciplines are more demanding of mathematical skills than the non-science fields. But not that the non-science students do not undertake similar skilled related subjects. However, Kurniawan et al. (2019) noted that science propels curiosity, critical thinking, open thinking, the desire to solve problems, and a sensitive attitude towards the environment.

Furthermore, the study provides insight into the differential attitude of science and non-science undergraduates towards teaching and learning statistics in Nigeria's tertiary institutions. Therefore, the study results indicate that the anxieties occasioned by statistical education could be more prevalent among the non-science students, and statistics anxiety contributes significantly to the trend. Thus, it becomes imperative that action be taken to improve statistical performance and ease tension.

Conclusion:-

The study aimed to compare student's attitudes towards statistics established a statistically significant difference between the attitudes of science and non-science students concerning statistics in the tertiary institutions. Also, it was found that statistical anxiety moderated the student's attitudes towards statistics. Thus, it is concluded that statistics anxiety contributes significantly to the variation between the attitude of science and non-science students towards the teaching and learning of statistics. The result of the study provided valuable data to educators, counselors, students, and parents. It also broadens our understanding of the probable explanation to the challenges associated with teaching and learning statistics in Nigeria's education landscape. Nevertheless, the study encountered a particular limitation that needs to be stated. For instance, the sample size was small and may not be dependable for generalization. Also, the design of the study did not allow for cause-effect determination. Future researchers are advised to include more representative samples and adopt pure experimentation to ascertain cause-effect relationships. However, we recommend that robust attitude change strategies be adopted in non-science settings and teachers with pedagogical proficiency in the statistics classroom.

References:-

1. Annapurna, M. I. (2017). Importance of Statistics and Mathematical Models in the Field of Social Sciences Research. Imperial Journal of Interdisciplinary Research, 3(4).

2. Arumugam, R. N. (2014). Student's attitudes towards introductory statistics courses at public universities using partial least square analysis abstract. *Interdisciplinary Journal of Contemporary Research in Business*, 6(4).
3. Ashaari, N. S., Judi, H. M., Mohamed, H., & Tengku Wook, T. M. (2011). Student's Attitude Towards Statistics course. *Procedia - Social and Behavioral Sciences*, 18. <https://doi.org/10.1016/j.sbspro.2011.05.041>
4. Ben-Zvi, D., & Garfield, J. (2008). Introducing the Emerging Discipline of Statistics Education. *School Science and Mathematics*, 108(8). <https://doi.org/10.1111/j.1949-8594.2008.tb17850.x>
5. Bilgin, A. A. B., Bulger, D., & Fung, T. (2020). Statistics: Your ticket to anywhere. *Statistics Education Research Journal*, 19(1).
6. Budé, L., van de Wiel, M. W. J., Imbos, T., & Berger, M. P. F. (2012). The effect of guiding questions on students' performance and attitude towards statistics. *British Journal of Educational Psychology*, 82(2). <https://doi.org/10.1111/j.2044-8279.2011.02031.x>
7. Cahyawati, D., Wahyudin, W., & Prabawanto, S. (2018). Attitudes toward statistics and achievement: between students of science and social fields. *Infinity Journal*, 7(2). <https://doi.org/10.22460/infinity.v7i2.p173-182>
8. Chew, P. K. H., & Dillon, D. B. (2014). Statistics Anxiety Update: Refining the Construct and Recommendations for a New Research Agenda. In *Perspectives on Psychological Science* (Vol. 9, Issue 2). <https://doi.org/10.1177/1745691613518077>
9. Coggon, D. (2015). The importance of statistics in health research. *Cogitare Enfermagem*, 20(1). <https://doi.org/10.5380/ce.v20i1.40626>
10. Cui, S., Zhang, J., Guan, D., Zhao, X., & Si, J. (2019). Antecedents of statistics anxiety: An integrated account. In *Personality and Individual Differences* (Vol. 144). <https://doi.org/10.1016/j.paid.2019.02.036>
11. Currey, J. D., Baxter, P. D., & Pitchford, J. W. (2009). Significance and importance: Some common misapprehensions about statistics. In *Cell Biochemistry and Function* (Vol. 27, Issue 8). <https://doi.org/10.1002/cbf.1620>
12. Dempster, M., & McCorry, N. K. (2009). The role of previous experience and attitudes toward statistics in statistics assessment outcomes among undergraduate psychology students. *Journal of Statistics Education*, 17(2). <https://doi.org/10.1080/10691898.2009.11889515>
13. Eichler, A., & Zapata-Cardona, L. (2016). Empirical Research in Statistics Education. https://doi.org/10.1007/978-3-319-38968-4_1
14. Faber, G., & Drexler, H. (2019). Predicting education science students' statistics anxiety: The role of prior experiences within a framework of domain-specific motivation constructs. *Higher Learning Research Communications*, 9(1). <https://doi.org/10.18870/hlrc.v9i1.435>
15. Field, A. (2002). *Discovering Statistics Using SPSS for Windows*. Turkish Online Journal of Distance Education, 3.
16. Fioravanti Pereira, R., Greca Dufranc, I. M., & Meneses Villagra, J. A. (2019). Ways of teaching statistics for the health area. *RevistaLatin-Americana de InvestigacionEnMatemáticaEducativa*, 22(1). <https://doi.org/10.12802/RELIME.19.2213>
17. Frost, J. (2017). The Importance of Statistics - Statistics by Jim. Statisticsbyjim.Com.
18. Garfield, J., & Ben-Zvi, D. (2007). How students learn statistics revisited: A current review of research on teaching and learning statistics. In *International Statistical Review* (Vol. 75, Issue 3). <https://doi.org/10.1111/j.1751-5823.2007.00029.x>
19. Gerald, B., & Allan, M. (2018). Effect of Cooperative Learning on Students' Attitude and Performance towards Probability Distributions in Statistics. *Journal of Education and Practice*, 9(14).
20. Gómez, E., Repetto, A., & Mattinello, G. (2012). Exploration and analysis of the attitude towards statistics in psychology students. *Liberabit. Revista de Psicología*, 18(1).
21. Gopal, K., Salim, N. R., & Ayub, A. F. M. (2020). Malaysian undergraduates' perceptions of learning statistics: Study on attitudes towards statistics using fuzzy conjoint analysis. *ASM Science Journal*, 13. [https://doi.org/10.32802/ASMSCJ.2020.SM26\(2.15\)](https://doi.org/10.32802/ASMSCJ.2020.SM26(2.15))
22. Griffith, J. D., Adams, L. T., Gu, L. L., Hart, C. L., & Nichols-Whitehead, P. (2012). Students' Attitudes Toward Statistics Across the Disciplines: A Mixed-Methods Approach. *Statistics Education Research Journal*, 11(2).
23. Groth, R. E. (2015). Working at the boundaries of mathematics education and statistics education communities of practice. In *Journal for Research in Mathematics Education* (Vol. 46, Issue 1). <https://doi.org/10.5951/jresmetheduc.46.1.0004>
24. Gupta, P., & V., N. (2020). The Impact and Importance of Statistics in Data Science. *International Journal of Computer Applications*, 176(24). <https://doi.org/10.5120/ijca2020920215>

25. Huang, L. (2018). A mixed-method investigation of social science graduate students' statistics anxiety conditions before and after the introductory statistics course. *International Journal of Higher Education*, 7(3). <https://doi.org/10.5430/ijhe.v7n3p156>
26. Jose, P. E. (2017). Observations about how we learn about methodology and statistics. In *Monographs of the Society for Research in Child Development* (Vol. 82, Issue 2). <https://doi.org/10.1111/mono.12303>
27. Judi, H. M., Ashaari, N. S., Mohamed, H., & Tengku Wook, T. M. (2011). Student's profile based on attitude towards statistics. *Procedia - Social and Behavioral Sciences*, 18. <https://doi.org/10.1016/j.sbspro.2011.05.038>
28. Koh, D., & Zawi, M. K. (2014). Statistics anxiety among postgraduate students. *International Education Studies*, 7(13). <https://doi.org/10.5539/ies.v7n13p166>
29. Koparan, T., & Güven, B. (2008). The effect on the 8th Grade Students' Attitude towards Statistics of Project-Based Learning. *European Journal of Educational Research*, 3(2).
30. Kurniawan, D. A., Astalini, A., Darmaji, D., & Melsayanti, R. (2019). Students' attitude towards natural sciences. *International Journal of Evaluation and Research in Education*, 8(3). <https://doi.org/10.11591/ijere.v8i3.16395>
31. Lavldas, K., Barkatsas, T., Manesis, D., & Gialamas, V. (2020). A structural equation model investigating the impact of tertiary students' attitudes toward statistics, perceived competence at mathematics, and engagement on statistics performance. *Statistics Education Research Journal*, 19(2).
32. Lieten, G. K. (2005). The importance of statistics. In *Child Labour*. Amsterdam University Press. <https://doi.org/10.1515/9789048520992-005>
33. Malik, S. (2015). Undergraduates' statistics anxiety: A phenomenological study. *Qualitative Report*, 20(2).
34. Murtonen, M., & Lehtinen, E. (2003). Difficulties experienced by education and sociology students in quantitative methods courses. *Studies in Higher Education*, 28(2). <https://doi.org/10.1080/0307507032000058064>
35. Mustam, A. A., Adnan, M., Johnny, J., & Setambah, M. A. B. (2020). Attitude towards statistics among pre-service teachers of the institute of teacher education. *Journal of Physics: Conference Series*, 1521(3). <https://doi.org/10.1088/1742-6596/1521/3/032011>
- Najmi, A., Raza, S. A., & Qazi, W. (2018). Does statistics anxiety affect students' performance in higher education? The role of students' commitment, self-concept, and adaptability. *International Journal of Management in Education*, 12(2). <https://doi.org/10.1504/IJMIE.2018.090705>
36. Nguyen, T. U. H., Charity, I., & Robson, A. (2016). Students' perceptions of computer-based learning environments, their attitude towards business statistics, and their academic achievement: implications from a UK university. *Studies in Higher Education*, 41(4). <https://doi.org/10.1080/03075079.2014.950562>
37. Olivier, J., & Bell, M. L. (2018). The Importance of Statistics in Cancer Research. *World Journal of Cancer Research*, 1(1). <https://doi.org/10.1166/wjcr.2013.1004>
38. Onwuegbuzie, A. J. (2004). Academic procrastination and statistics anxiety. *Assessment and Evaluation in Higher Education*, 29(1). <https://doi.org/10.1080/0260293042000160384>
39. Ribeiro, V., Rocha, A., Peixoto, R., Portela, F., & Santos, M. F. (2017). Importance of statistics for data mining and data science. *Proceedings - 2017 5th International Conference on Future Internet of Things and Cloud Workshops, W-FiCloud 2017, 2017-January*. <https://doi.org/10.1109/FiCloudW.2017.86>
40. Rosli, M. K., & Maat, S. M. (2017). Attitude towards statistics and performance among postgraduate students. *AIP Conference Proceedings*, 1847. <https://doi.org/10.1063/1.4983881>
41. Saidi, S. S., & Siew, N. M. (2018). Assessing Students' Understanding of the Measures of Central Tendency and Attitude towards Statistics in Rural Secondary Schools. *International Electronic Journal of Mathematics Education*, 14(1). <https://doi.org/10.12973/iejme/3968>
42. Sandoz, E. K., Butcher, G., & Protti, T. A. (2017). A preliminary examination of willingness and importance as moderators of the relationship between statistics anxiety and performance. *Journal of Contextual Behavioral Science*, 6(1). <https://doi.org/10.1016/j.jcbs.2017.02.002>
43. Shangodoyin, D. K., & Lasisi, T. A. (2011). The Role of Statistics in National Development with Reference to Botswana and Nigeria Statistical Systems. *Journal of Sustainable Development*, 4(3). <https://doi.org/10.5539/jsd.v4n3p131>
44. Sharma, S. (2017). Definitions and models of statistical literacy: a literature review. *Open Review of Educational Research*, 4(1). <https://doi.org/10.1080/23265507.2017.1354313>
45. Siew, C. S. Q., McCartney, M. J., & Vitevitch, M. S. (2019). Using network science to understand statistics anxiety among college students. *Scholarship of Teaching and Learning in Psychology*, 5(1). <https://doi.org/10.1037/stl0000133>

46. Smith, T. F., & Capuzzi, G. (2019). Using a Mindset Intervention to Reduce Anxiety in the Statistics Classroom. *Psychology Learning and Teaching*, 18(3). <https://doi.org/10.1177/1475725719836641>
47. Tamm, M. V. (2019). Importance of extreme value statistics in biophysical contexts. *Physics of Life Reviews*, 28. <https://doi.org/10.1016/j.plrev.2019.03.001>
48. Tonsing, K. N. (2018). Instructor immediacy and statistics anxiety in social work undergraduate students. *Social Work Education*, 37(2). <https://doi.org/10.1080/02615479.2017.1395009>
49. Vahedi, S., Farrokhi, F., Farahnaz, G., & Ali, I. (2012). The relationship between procrastination, learning strategies and statistics anxiety among Iranian college students: A canonical correlation analysis. *Iranian Journal of Psychiatry and Behavioral Sciences*, 6(1).
50. Veloo, A., Krishnasamy, H. N., & Ali, R. M. (2018). Reflection on teaching' statistics in education' for postgraduate students. *Indian Journal of Public Health Research and Development*, 9(11). <https://doi.org/10.5958/0976-5506.2018.01641.8>
51. Verma, J. P., & Verma, J. P. (2019). Importance of Statistics in Psychology. In *Statistics and Research Methods in Psychology with Excel*. https://doi.org/10.1007/978-981-13-3429-0_1
52. Walsh, J. J., & Ugumba-Agwunobi, G. (2002). Individual differences in statistics anxiety: The roles of perfectionism, procrastination, and trait anxiety. *Personality and Individual Differences*, 33(2). [https://doi.org/10.1016/S0191-8869\(01\)00148-9](https://doi.org/10.1016/S0191-8869(01)00148-9)
53. Wiberg, M. (2009). Teaching statistics in integration with psychology. *Journal of Statistics Education*, 17(1). <https://doi.org/10.1080/10691898.2009.11889509>
54. Williams, A. S. (2010). Statistics anxiety and instructor immediacy. *Journal of Statistics Education*, 18(2). <https://doi.org/10.1080/10691898.2010.11889495>.