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The effect of Statistics Anxiety on Statistics Courses Achievement in Psychology Students

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ABSTRACT

Statistics courses are crucial since they represent formal research method exposure and afford students analytical skills. On the contrary, many university students taking statistics courses report statistics anxiety, particularly psychology students. However, there were few studies about the relationship between statistics anxiety and achievement in statistics courses among undergraduate psychology students. The objective of this study is to investigate the effect of statistics anxiety on statistics course achievement among students of psychology. Respondents were 69 psychology students (53 women, 16 men) from a private university in Jakarta, who enrolled in statistics courses Statistics anxiety was measured by adaptation of STARS (Statistical Anxiety Rating Scale), which consists of 20 items with a 4-point Likert-type scale, which measures five theoretical components, i.e. test and class anxiety, computation self-concept, worth of statistics, fear of asking for help, and fear of statistics teachers. Cronbach's alpha coefficient for reliability was .819 for the entire scale. Results showed that achievement in statistics course were not significantly affected by statistics anxiety, $R^2 = .007$, $F(1, 67) = .493$, $p = .485$. Surprisingly, age has a negatively significant effect on statistics courses' achievement. Moreover, women have higher statistics anxiety than men.

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INTRODUCTION

Statistics anxiety is a particular form of performance and test anxiety that is found in students of psychology (Paechter et al., 2017, Bourne, 2018). It is also a phenomenon that happens a lot in psychology students (University of Kansas, 2019; Kaufmann et al., 2022), including most psychology students in Indonesia. Moreover, they are not aware that statistics will be a course that they have to attend. Many students report that they had high levels of anxiety when they enrolled in statistics courses. Onwuegbuzie and Wilson (as quoted in Siew et al., 2019) report that statistics anxiety is experienced by 80% of graduate students in the social and behavioral sciences.

On the other hand, a statistics course is important because it represents formal exposure to research methods and affords students analytical skills, especially in psychology. Research skill is an important skills that a psychology student should have. Statistical knowledge is important for students to answer the research questions based on the data they collected. With basic statistical knowledge, students can organize a set of data, use suitable statistical tests to analyze the data to answer research questions, and also to interpret the results and report it in papers. In addition, according to the Indonesian Psychology Higher Education Organizers Association (A2TPI), basic statistics is a compulsory study material in undergraduate psychology.

Statistics anxiety is the feelings of anxiety resulting from gathering, processing, and interpreting data for conducting statistical analyses (Cruise et al., as quoted in Tutkun, 2019). In addition, Kaufmann et al. (2022) defined statistics anxiety as feelings of apprehension upon being confronted with statistics. Zeidner (as quoted in Nielsen & Kreiner, 2021) adds to these definitions by stating that statistics anxiety is followed by tension, worry, and physiological symptoms of stress when students take a statistics class.

There are six components of statistics anxiety, i.e.: (a) worth of statistics, (b) interpretation anxiety, (c) test and class anxiety, (d) computational self-concept, (e) fear of asking for help, and (f) fear of statistics teachers (Cruise, et al., as quoted in Siew et al., 2019). *The worth of statistics is* defined as a student's perception of the relevance of statistics. The anxiety experienced when a student tries to interpret statistical data and make a decision based on statistical data is referred to as *interpretation anxiety*. *Test and class anxiety* related to the anxiety involved when they attend a statistics class or take a statistics test. A student's perception of her/his ability to do mathematics in general, not only in statistics, is known as *Computational self-concept*. *Fear of asking for help* concerned with the anxiety experienced when they ask their friends or teacher for help in understanding statistics. Last, the *fear of statistics teachers* is the student's perception of the statistics teachers.

Students with higher levels of statistics anxiety have weaker academic performance in statistics courses (Bourne, 2018). Most studies are reporting a negative relationship between statistical anxiety and the student's performance (Najmi et al., 2018). Afdal et al. (2019) found a significant contribution of statistical anxiety to the statistics learning outcomes.

On the other hand, few studies examine the interrelationship between age and gender and statistics anxiety (Ralston et al., 2020). Edirisooriya and Lipscomb (2021) found that older students have the highest levels of statistics anxiety. Most studies find that women had higher anxiety of statistics than men (Ralston et al., 2020). Baloğlu (as quoted in Ralston et al., 2020) found that older women and older men have the highest total statistics anxiety and the lowest total statistics anxiety, respectively.

Based on the explanations above, this present study aims to determine the effect of statistics anxiety on statistics course performance. The hypothesis for the current study is that students who had higher statistics anxiety will have a lower performance in the statistics courses.

RESEARCH METHODOLOGY

Participants

Participants were 69 psychology students (55 females, 18 males) in the third semester, aged 16-27 years (M = 19.35, SD = 1.63) from a private university in Jakarta. They were from two Statistics Course classes but taught by the same lecturer.

Instrument

Cruise's Statistical Anxiety Rating Scale (STARS) was used to measure statistics anxiety. STARS currently is the most widely used to measure statistics anxiety (O'Bryant et al., 2021, Ralston et al., 2020). STARS were adapted to Indonesian and used by Bundianto (2017), consisting of 19 items with a 4-point Likert-type scale. It measures five components of statistics anxiety, i.e.: worth of statistics (eight items), test and class anxiety (seven items), computational self-concept (one item), fear of

asking for help (two items), and fear of statistics teachers (one item). Scale reliability were .840 and item-rest correlation around .281 to .630. This scale was administered at the beginning of the statistics course. On the other hand, statistics course achievement is measured by students' final grades in statistics courses ranging from 0 - 100.

Statistical Analysis

Regression analysis was used to determine the effect of statistics anxiety on statistics course performance. Independent samples t-test was used to compare statistics anxiety between men and women. All statistical analyses run by JASP 0.10.2.

RESULTS AND DISCUSSIONS

Table 1 showed descriptive statistics for statistics anxiety, age, and statistics achievement. Statistics anxiety score ranged from 28 to 59 (M = 43.46, SD = 6.74) and normally distributed. Moreover, women (M = 44.39, SD = 7.03) have higher statistics anxiety than men (M = 40.37, SD = 4.57), t = 2.148, p = .035.

Table 1.
Descriptive statistics for variables (N = 69)

Variables	Min.	Max.	M	SD
Statistics anxiety	28.00	59.00	43.46	6.74
Age	16.00	27.00	19.35	1.63
Statistics achievement	3.60	81.30	54.91	17.75

Regression analyses were conducted to analyze the effect of statistics anxiety on statistics achievement. Results showed that achievement in statistics course were not significantly affected by statistics anxiety, R^2 = .007, $F(1, 67)$ = .493, b = -.225, p = .485 (table 2). Same results were found when statistics achievement predicted from five theoretical dimensions of statistics anxiety, R^2 = .066, $F(1, 63)$ = .897, p = .489. Although its R^2 is slightly higher, it still found no significant effect on statistics achievement.

Table 2.
Predicting statistics achievement from statistics anxiety and its dimensions

Predictor	b	t
R^2 = .007, $F(1, 67)$ = .493, p = .485		
Constant	64.704	4.588**
Statistics anxiety	-0.225	-0.702
R^2 = .066, $F(1, 63)$ = .897, p = .489		
Constant	58.511	3.962**
Test and class anxiety	6.227	1.364
Worth of statistics	-0.801	-0.124
Computational self-concept	-3.153	-0.908
Fear of asking for help	-4.388	-0.777
Fear of statistics teachers	-1.419	-0.386

** p < .001

Adding age and gender to the regression analysis (table 3), age had negatively significant effect (b = -3.667, t = -2.875, p = .005) to statistics achievement but statistics anxiety still had no effect (b = -.377, t = -1.179, p = 1.179). Surprisingly, it found that age had a negatively significant effect on statistics course achievement. It is similar to Edirisooriya and Lipscomb (2021), who found that older students have the highest levels of statistics anxiety.

Table 3.
Predicting statistics achievement from Statistics anxiety, age, and gender

Predictor	b	t
Step 2: R^2 = .120, $F(3, 65)$ = .493, p = .038		
Constant	14.761	4.721**
Statistics anxiety	-0.377	-1.179
Age	-3.667	-2.875*
Gender	-2.204	-0.439

* p < .05; ** p < .001

Contrary to Alizamar et al. (2019) who found that there were no significant statistical anxiety differences between male and female students and also Edirisooriya and Lipscomb (2021) who found that male students exhibited higher levels of anxiety toward statistics, this study found that women have higher statistics anxiety than men. It can be explained since women perceived themselves to have poorer math abilities (MacArthur, 2020).

CONCLUSION

The objective of this study is to determine the effect of statistics anxiety on statistics course achievement in psychology students. However, results showed that there was no significant effect of statistics anxiety on statistics course achievement, as a single variable and from its dimensions. It means that other relevant factors, such as motivation, and attitude toward statistics, more contribute to statistics course performance.

There are some limitations in this present study that should be considered in terms of the generalizability of the present findings and future research. First, since this study found that statistics course achievement is not affected by statistics anxiety, future research can study other variables such as motivation or attitude toward statistics. Second, the participants in this study were only from a university in Jakarta. Then, it should not be generalized to other faculty of psychology in another university. Future research should get psychology students from the various university. The small number of participants was another limitation. Sixtynine participants should not be considered an adequate sample. Therefore, future research should collect a minimum of 272 according to Isaac and Michael (Sugiyono, 2018). Third, STARS used in this study only measured five of six components of statistics anxiety and two dimensions were only measured by a single item. Interpretation anxiety as a dimension of statistics anxiety was not included in STARS as used in Bundianto (2017). The instrument used in future research should be adapted from the original Cruise's STARS.

There were some practical implications of the present study, especially for reducing statistic anxiety. Since older students found that they experience higher statistics anxiety, the teacher should design and deliver statistics courses that consider the unique needs of students of different gender and varying ages. They can be encouraged to seek assistance regarding difficulties in statistics courses.

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