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Contribution of statistical anxiety to student learning outcomes: Study in Universitas Negeri Padang

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Abstract. The purpose of this study is to describe the statistical anxiety contribution to student learning outcomes. The sample of the study was 368 students of Universitas Negeri Padang, who attended Statistical courses in the semester of January-June 2018. Statistical anxiety data were collected through statistical anxiety rating scale (STARS) which analyzed descriptively. The results showed that there was a statistical anxiety contribution to the student statistical learning outcomes, with a contribution value of 10.4 %. Implications are discussed further for learning process in higher education.

1. Introduction

Statistics is a field of study to understand how well and the rules relating to data collection, processing, and conclusion, and interprets the data in a simple language [1-3]. Experts stated many positive benefits of statistics learning, because in human life are always dealing with figures, analysis, and interpretation. Even the majority of current jobs require skill to present statistical data and even policy decision making [4]. Students also require statistical ability to assist in scientific research and study completion, so the statistics required to be learned by students at the college despite coming from social science [5]. In addition, statistical learning will also guide the students to be able to think critically and be able to present quantitative data to be more easily understood [4]. The problem is students who have numerical disabilities often have a difficulty with statistics and found that the background of student math skills will have an impact on his attitude towards the subjects indicated a statistical although the relationship is not direct [6,7]. For some students who came from the social science, study statistics is often regarded as difficult and even cause anxiety [6,8,9] which some experts called as statistical anxiety [1,4,7]. Suggested some statistical anxiety construct that builds on individual comprising; (1) *worth of statistics*, which refers to an individual's perception of the benefits that can be drawn from studying statistics in life; (2) *interpretation of anxiety*, the anxiety experienced when dealing with matters that require



interpretation of the data; (3) *test and class anxiety*, the anxiety experienced when taking a statistics class; (4) *the computation of self-concept*, which refers to the issue of individual skills in statistical calculations; (5) *fear of asking for help*, namely anxiety when asked for assistance by another person; and (6) *fear of statistics teachers*, namely the individual's perception of the statistics teacher. Constructs compiled further developed through the scale of the Statistical Anxiety Rating Scale (STARS) [1], through various research projects [10], and has been measured and tested on various statistical studies of anxiety in America by Baloğlu [11], the structure of the statistical anxiety student population in Malaysia [5].

Various studies have also found that statistical anxiety correlated with academic achievement of students, especially in subjects such statistics itself [9,12–15]. Describe the students with a high level of anxiety statistical tend not to try to be optimal and less efficient in using the time to study statistics, so that the learning outcomes obtained was less than optimal [16]. This study aims to explore the contribution of statistical anxiety on student learning outcomes.

2. Method

The study was a descriptive quantitative research at Universitas Negeri Padang students enrolled in the semester from January to June 2018. Data were collected through questionnaires The Statistical Anxiety Rating Scale / STARS which was developed [1], adapted to use in *Bahasa*, which is distributed *online*. Questionnaires filled out by 449 students, but the data can be processed only 368, because the rest is not complete charging the questionnaires. The questionnaire using 5 points Likert scale (from not anxious to strongly anxious) on the 23 items in the initial statement, and 28 of the next statement items measuring the approval of the respondents (from strongly agree to strongly disagree) [10]. Results analysis RASCH models suggest that reliability scores person (Extreme and Non-Extreme) is 0.94. While the score reliability by Cronbach's alpha values (KR-20) was 0.98, indicating that the interaction between the person and item was very good. Besides, the value of the sensitivity pattern of responses person (non-Extreme) +1.01 logit (INFIT MNSQ) and sensitivity values overall pattern of responses person (non-Extreme) +1.00 logit (OUTFIT MNSQ) indicate that they are in the ideal range (+0.5 > MNSQ < +1.5) [17–19]. More RASCH model analysis also found that the reliability of the items viewable score is 0.98. This indicates that the quality of the items used in the measurement is special. Besides, the value of the sensitivity pattern of response +1.00-person logit (INFIT MNSQ) and sensitivity values overall pattern of responses person +1.01 logit (OUTFIT MNSQ) indicate that they are in the ideal range (+0.5 > MNSQ < +1.5). This indicates the items have a very good quality for the condition of the measurements made. Further, the statistical anxiety contribution to student learning outcomes was processed through a linear regression analysis.

3. Result and discussion

The results of statistical analysis of statistical anxiety contribution to the student learning outcomes are given in table 1.

Table 1. Simple linear regression analysis and significance (X) to (Y).

Model	R	R Square	Sig.
X.Y	0.322	0.104	0.000

Based on the analysis, can be seen that the significant value of 0000 which states that less than 0.05 (0.000 < 0.05), can be concluded that the statistical anxiety variable (X) effect on student learning outcomes variable (Y). Besides, the R-value of 0322, suggests a possible link between statistical anxiety and student learning outcomes. It can be seen the value of R Square of 0.104. This means that the statistics anxiety (X) contribute to the student learning outcomes (Y) of 10.4%, while the rest (89.6%) is influenced by other variables that could not be explained in the study of this research. More to see the regression equation can be seen in table 2 below.

Table 2. Regression equations and significance of X to Y.

	Unstandardized Coefficients	
	B	Std. Error
(Constant)	10.363	0.412
Anxiety	-0.018	0.003

In table 2, the value of the constant (a) amounted to 10 363, while the value of statistics anxiety (b) of -0.018. So, the regression equation becomes: $\hat{Y} = 10.363 - 0.018X$. The regression formula shows that each increase of one point on a statistical study of anxiety, accompanied by a decrease of 0.018 student results. The regression coefficient is negative, so that it can be stated that the influence of anxiety variable (X) to the value (Y) is negative, meaning that the increase in statistical anxiety will cause a decrease in student results.

This study illustrates that the learning outcomes are affected by many factors within the individual, including internal factors. Revealed that the learning outcomes are influenced by internal factors are motivation, anxiety, attention and observation [20]. Although anxiety is not only affecting the learning outcomes but this needs to be overcome. The results also support the statistical theory that anxiety is one of the predictors of student success in statistics courses. Student anxiety associated with feelings of worry and nervousness arising from within the students themselves. This feeling can be caused by a weak understanding of statistical subjects. It can be seen from the results obtained by students studying statistics at the time of taking statistics courses. Based on the research results of anxiety experienced by students could trigger a decline in the level of concentration, which in turn affects the learning outcomes [21]. Anxiety will have an impact on statistical learning outcomes because of the impact of anxiety to make students incapable of concentration, giving rise to feelings of confidence in ability.

The study also provides insight regarding the results of statistical analysis contribution of statistical anxiety components to statistics learning outcomes that can be seen in table 3.

Table 3. Contributions of statistical anxiety components to statistics learning outcomes.

Statistical Anxiety Components	R	R Square	Sig.
1) <i>Worth of statistics</i>	0.255	0.065	0.000
2) <i>Interpretation anxiety</i>	0.183	0.034	0.001
3) <i>Test and class anxiety</i>	0.317	0.101	0.000
4) <i>Computation self-concept</i>	0.301	0.090	0.000
5) <i>Fear of asking for help</i>	0.244	0.059	0.000
6) <i>Fear of statistics teachers</i>	0.167	0.028	0.003

Based on the analysis above are the significant value of 0000 for component 1, 3, 4, 5 which states that less than 0.05 ($0.000 < 0.05$), while for component (2 and 6) is still at the level of significance or is less than 0.05, that of 0001 (component 2) and 0003 (component 6) so that it can be concluded that the entire variable statistical anxiety (X) effect on variable statistics learning outcomes (Y).

Besides, the values of R in the whole component are 0.255, 0.183, 0.317, 0.301, 0.244, and 0.167. It indicates the correlation coefficient between the statistical anxiety with statistics learning outcomes. Furthermore, it can be seen the value of R Square on the whole component one to six are 0065, 0034, 0101, 0090, 0059, and 0028. This means that the statistical anxiety (X) contributed most to the statistics learning outcomes (Y) is the 3rd component (*test and class anxiety*) of 10.1%, while others below it. So, it can be stated that component 3 (*test and class anxiety*) is a considerable influence on the value obtained by the students. Further from the results of the regression analysis, the lecturer can intervene when the class fear of statistical test in accordance with the lecturers whether the learning process that is done every lecture, so it should be reconsidered to increase the value of statistical subjects.

Statistical anxiety relationship with student learning outcomes have been tested in previous studies involving a variety of other variables related to learning outcomes, one of the most dominant is the

anxiety during the exam (*test anxiety*). It is known that anxiety in class while following statistics class and statistical tests (*test and class anxiety*) is one of statistical anxiety component [1]. For students with a high level of statistical anxiety, they will experience nervous at the time of the exam. The nervousness may persist during the entire test and can interfere with the performance of students when answering exam questions. Students could not think relaxed in the process and answer exam questions as it should, while the statistical problems usually require data analysis and interpretation requires a calm and sharp thinking. With the emergence of anxiety during the exam statistics, there will be a negative relationship between statistical anxiety with the student learning outcomes obtained [9,22]. Also stated that anxiety for exams can be moderated by the difficulty level of the exam, where students with high levels of anxiety can only complete the test with a low to moderate difficulty, whereas students with low anxiety level can complete the exam with high difficulty though [23]. This show that students with high statistical anxiety have worse performance when statistical test than students with low statistical anxiety and it is influenced by the level of difficulty of the test [24].

Thus, test anxiety as one of the statistical anxiety component can be viewed as one of student success predictor in statistics course. In addition, the statistical anxiety is also associated with learning outcomes by taking into account variables academic procrastination [25]. Academic procrastination related to statistics on student anxiety. Revealed when students have a habit of procrastinating in doing the task (academic procrastination) it can inhibit learning achievement [26]. Explained that this procrastination may be a delay in the manufacture of tasks and learning delays at the time will take the statistics test [27]. With the delay, the students will experience a feeling of fear of failing the exam, and anxiety during the exam, so it will also affect the learning results obtained. In addition, students with high level of statistical anxiety can also be identified by looking at the high academic procrastination, and the tendency to do a little effort, and allocate time to study the statistics to be less efficient, so that the learning outcomes obtained was less than optimal [16].

Lecturer in charge of statistical subjects support can help these students overcome anxiety by giving encouragement or motivation to students, so that students become more confident. More professors use learning strategies that statistical learning process becomes more easily understood by students [25]. Various treatments can be done by the counselor to reduce anxiety through guidance and counseling services. Some of them are Eye Movement Desensitization and Reprocessing (EMDR), Cognitive Behavioral Therapy (CBT), internet Cognitive Behavioral Therapy (iCBT), Rational Emotive Behavior Therapy (REBT), Hypnotherapy, Neuro-Linguistic Programming (NLP), Music Therapy, Desensitization and Emotional Freedom Techniques [28,29,30,31] that can be used to help clients problems with their anxieties, may include statistical anxiety.

4. Conclusion

In conclusion, the contribution of statistical anxiety (X) is significant to the statistics learning outcomes (Y), seen from donations given statistical anxiety 10.4% of student learning outcomes. Furthermore, although the contributions of statistics anxiety just 10.4 %, but still require more serious treatment in order to avoid a bad outcome. Besides, the regression coefficient is negative, so that it can be stated that the influence of anxiety variable (X) to the learning outcomes (Y) is negative, which means an increase statistical anxiety causes a decrease in student learning outcomes. Based on analysis of statistical anxiety component contribution to student learning outcomes obtained that the 3rd component have more influence on student learning outcomes, with regard to the anxiety experienced when taking a statistics class and anxiety when examination. The *test and class anxiety* contributes 10.1% of the student's statistical learning outcomes. Furthermore, the need for statistical anxiety prevention by building a good relationship with the student when the first meeting, to provide an understanding that the statistical learning is easier and provide motivation for students who are less able to do math. Furthermore, lecturers can use learning strategies that interesting, to attract students in a statistics course, one of which was to apply learning strategies as "serious but relaxed" so that students are not nervous in receiving lessons given but still remain in the category of serious in following the lecture. Meanwhile, to overcome

anxiety during exams, teachers can customize the abilities of test items and abilities of students, and lecturers also pay attention to students who have a deficiency in the field of numerical.

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