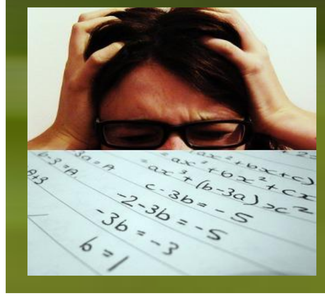

Statistics Anxiety Fluctuates Over a Semester and Decreases with Experience

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Abstract

The study explored the fluctuations of statistics anxiety over four time periods during a trimester teaching period. Participants were 37 students enrolled in statistics courses. Results revealed significant reductions in anxiety, but only for students who had completed at least one statistics course before. This underscores the need for control groups in future research.

Introduction

Statistics anxiety (SA) refers to the feelings of anxiety experienced by individuals doing a statistics course (Cruise, Cash, & Bolton, 1985). SA has been conceptualized as consisting of six components (Cruise et al., 1985):

1. *Worth of statistics* relates to an individual's perception of the relevance of statistics.
2. *Interpretation anxiety* refers to the feelings of anxiety encountered when interpreting statistical data.
3. *Test and class anxiety* deals with the anxiety involved when enrolled in a statistics class or when taking a statistics test.
4. *Computation self-concept* relates to an individual's self-perception of his or her ability to understand and calculate statistics.
5. *Fear of asking for help* assesses the anxiety experienced when seeking help.
6. *Fear of statistics teachers* refers to an individual's perception of the statistics teacher.

The debilitative effects of SA have been well documented. Lalonde and Gardner (1993) found that SA shared a consistent negative relationship with quizzes (r = -.31), first term exams (r = -.49), second term exams (r = -.45), and final grade (r = -.48).

Given the debilitative effects of SA, researchers have sought to develop and test interventions for it (Pan & Tang, 2004; Wilson, 1998). Nevertheless, these studies utilized a one-group pretest-posttest design to evaluate their interventions. The lack of a control group prevents these researchers from making inferences about the effectiveness of their interventions. Furthermore, a research gap exists with regards to the fluctuations of SA over a semester (i.e. from pretest to posttest).

In addition, there is a lack of consistency with regards to the time period in which SA is being assessed. For example, Collins and Onwuegbuzie (2007) assessed SA on the first day of class while Onwuegbuzie (1999) assessed SA before the midterm examination of the course. Unfortunately, little is known about the preexisting level of SA at these different time periods.

The purpose of this study is to bridge these research gaps and to explore the fluctuations of SA. It is hypothesized that there will be a significant change in SA scores over four time periods of a semester.

Method

Participants were 37 students (65% females) enrolled in three statistics courses at the James Cook Australia Institute of Higher Learning, Singapore. The ages of the participants ranged from 18 to 50 years (M = 22.76, SD = 6.65). Participants were further divided into two groups: novice (n = 14) and experienced (n = 23). Participants in the experienced group had completed at least one statistics course before.

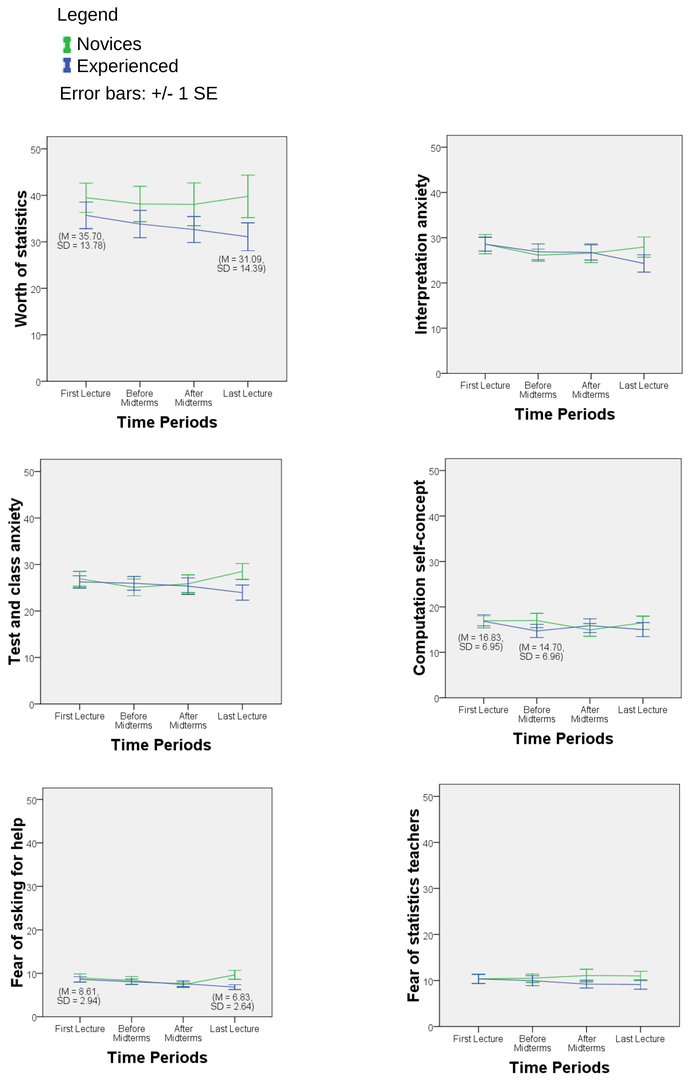
Participants complete the Statistical Anxiety Rating Scale (STARS) (Cruise et al., 1985) at four different time periods: the first lecture (Time 1), before the midterm examinations/presentations (Time 2), after the midterm examinations/presentations (Time 3), and the last lecture (Time 4). The STARS assesses the six components of SA and a high score on any subscale represents high anxiety on that component (Cruise et al., 1985).

Results

A series of one-way repeated measures ANOVA were conducted to compare the mean scores for each component of SA over the four time periods. No significant difference was found for the novices group.

Among the experienced group, a significant difference was found for worth of statistics [F(3, 66) = 3.47, p < .05], computation self-concept [F(3, 66) = 2.98, p < .05], and fear of asking for help [F(3, 66) = 3.03, p < .05], with anxiety reduction in each of these components for the experienced group.

Post hoc tests were conducted using the paired t-test procedure, with the probability value adjusted by applying a Bonferroni correction (.05/6 = .008). Means and standard deviations of significant time periods are displayed in the figures below.



Discussion

The fluctuations of SA were examined throughout the duration of three statistics courses (at different levels) and the results provided partial support for the hypothesis. A significant change in SA scores was found *only* for students who had undertaken at least one statistics course before (i.e. the experienced group). Specifically, it appears that anxiety related to 'worth of statistics' and 'fear of asking for help' were significantly reduced by the time of the last lecture whereas anxiety associated with 'computation self-concept' was significantly reduced before the midterm examinations/presentations.

The results painted a worrisome picture of SA as a relatively stable construct for the novices group. Students entered their first statistics course with a moderate level of SA and this anxiety remained consistent throughout the course. Nevertheless, it is consoling to find that three out of six components of SA (Cruise et al., 1985) were significantly reduced for the experienced group. Although the first statistics course did nothing for a student's level of SA, the successful completion of at least one statistics course seems to facilitate the reduction of SA for subsequent statistics courses.

The present findings have important implications for the understanding of SA. It is also important to note that these findings occurred in the absence of any interventions. Thus, this underscores the need for a control group to serve as a baseline in research on SA intervention. Furthermore, researchers should also be consistent in the time period in which they assess SA. Given the observed reductions in three out of six components of SA for the experienced group, it seems likely that SA might be differentially related to other variables depending on the time period in which SA was assessed.

Certain limitations must be noted. Firstly, the sample size (n = 37) was inadequate and this increases the chance of committing a Type II error. SA might fluctuate more than what was being found in the current study. An analysis using G*Power (Faul, Erdfelder, Buchner, & Lang, 2009) suggests that the sample size should be at least 108. Secondly, the results were based on a biased sample. It seems intuitive that participants who complete all four time periods were more motivated and determined than participants who did not complete all four time periods. In fact, preliminary analysis showed that the former tended to have less anxiety associated with fear of asking for help than the latter. Finally, practice effects should be considered. Due to the close proximity of the midterm examinations to the last lecture for the novice group, the STARS was administered for three consecutive weeks for Time 2, 3, and 4. Students might recall their responses and this might explain the relative stability of SA for the novices group.

Future research should seek to replicate the current study with an adequate sample size. Secondly, researchers should look into the facilitative effects on SA of completing at least one statistics course successfully. Lastly, since different components of SA fluctuate differently, it makes sense for interventions to be designed and tested for each component.

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