

THE INTERNATIONAL STUDENT AND POM: STATISTICS ANXIETY

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ABSTRACT

Do international students suffer from statistics anxiety in Production and Operations Management classes? To examine this, forty international students and one hundred-thirty-two domestic students were given the Statistics Anxiety Rating Scale (STARS) at the beginning of a Production and Operations Management (POM) class. The results were analyzed using the Mann-Whitney-Wilcoxon nonparametric test. The results somewhat mirrored a similar study of beginning statistics students. The international students differed significantly on three of the six factors revealed by STARS.

BACKGROUND

Statistics anxiety is defined as "the feelings of anxiety encountered when taking a statistics course or when doing statistical analyses; that is gathering, processing and interpreting data" (Cruise, 1985). Relatively few studies have concentrated entirely on POM. Students taking POM in an accelerated time frame recorded higher levels of statistics anxiety. This study found that students recorded significantly higher levels of statistics anxiety in night classes or summer classes than those students who took POM in the traditional MWF or TR format (Bell, 2003). International students were found to have significantly higher anxiety scores in POM than their domestic counterparts in two distinct studies (Bell, 1998; Bell, 2001). Statistics anxiety is negatively related to statistics achievement (Baloglu & Zelhart, 2003). Other studies have found that humor had an effect on anxiety levels (Berk & Nanda, 1998). Statistics anxiety adversely affects students' test performance, self-efficacy, and attitude toward subject matter. Removing time constraints on tests effectively lowered statistics anxiety levels (Onwuegbuzie, et. al., 1997). Younger females were found to flourish in single-sex classrooms (Campbell & Evans, 1997) and women experienced higher levels of statistics anxiety than men (Onwuegbuzie et. al., 1993). Students taught entirely via computers reported less statistics anxiety than those who opted for a traditional course (Bell & Weller, 2006). Mathematical background, namely a five-hour calculus course, significantly lowered statistics anxiety (Bell, 2003). Since international students have a better mathematics background than their domestic counterparts (Madison & Hart, 1990), will this mean lower statistics anxiety?

METHOD

In the spirit of Corey's "action research" of the 1950s, the Statistics Anxiety Rating Scale was administered to forty international students and one hundred-thirty-two domestic students enrolled in an introductory Production and Operations Management course. What is "action research"? Corey defines "action research" to be "deliberate, solution oriented investigation which is designed,

conducted, and implemented by teachers themselves in order to improve teaching in the classroom" (Corey, 1954). The data were recorded over a four-year time period. The instruments were administered at the beginning of the course. The classes were taught by the same instructor, using the same text. Due to the fact that STARS utilizes a five-point Likert scale that is unbalanced, the level of measurement is ordinal. Ordinary one-way ANOVA needs, at least, interval measurements. Hence, the nonparametric Mann-Whitney-Wilcoxon test was used to determine if the two groups differed. Otherwise, Excel was utilized for most calculations (Anderson, Sweeney, & Williams, 1996).

INSTRUMENT

The Statistics Anxiety Rating Scale (STARS) consists of two parts. The first part presents twenty-eight situations often associated with statistics anxiety. These items are scored on a Likert-type scale from one to five, with a "one" indicating no anxiety with that situation while a "five" indicates considerable anxiety. The second part consists of twenty-eight statements dealing with statistics, with responses recorded on a Likert-type scale from one (no anxiety) to five (considerable anxiety). Hence, the lower the score, the lower the anxiety level. Six factors are revealed in STARS: worth of statistics, interpretation anxiety, test and class anxiety, computation self-concept, fear of asking for help, and fear of statistics teachers (Cruise, 1985).

Factor 1 - Worth of Statistics - This factor deals with a student's perception of the value of a statistics course. A person scoring high on this factor sees little or no value in a statistics course. A student scoring high on this factor also feels that statistics does not "fit" their personality, thus indicating a negative attitude toward statistics (Cruise, 1985).

Factor 2 - Interpretation Anxiety - This factor is concerned with anxiety rising from interpreting statistical data. This could arise from deciding which statistical test to utilize or what to do with the null hypothesis (Cruise, 1985).

Factor 3 - Test and Class Anxiety - This factor deals with anxiety related to taking a statistics course or examination. The student that scores high on this factor experiences anxiety when enrolling in or taking a statistics course, solving statistical problems, or taking an actual statistic test (Cruise, 1985).

Factor 4 - Computation Self-concept - This factor reveals anxiety associated with actual mathematical computations, thus relating to classical mathematics anxiety. The student that scores high on this factor experiences anxiety because it involves mathematical calculations and the student feels inadequate when comprehending statistics (Cruise, 1985).

Factor 5 - Fear of Asking for Help - This factor reveals a fear of asking a fellow student or the professor for assistance with statistics problems (Cruise, 1985).

Factor 6 - Fear of Statistics Teachers - This factor deals with the perception of the statistics teacher. A person scoring high on this factor questions "the humanness of the teacher." This person views the statistics teacher as "lacking the ability to relate to the student as a human being" (Cruise, 1985).

DISCUSSION

Factor 1 – Worth of Statistics – The international students scored significantly lower, indicating less statistics anxiety than the domestic group ($Z = -1.47$, $p = .0708$) (Anderson, et. al., 1996). The means and corresponding percentiles are shown below:

Group	Mean	Percentile
International	37.075	65th
Domestic	39.508	72nd (Cruise, 1985)

Factor 2 – Interpretation Anxiety – There was a highly significant difference between the means of the international and domestic students with regard to this factor ($Z = 4.38$, $p = .000006$) (www.davidmlane.com/hyperstat/z_table.html). The means and percentiles are as follows:

Group	Mean	Percentile
International	30.475	76th
Domestic	26.129	60th (Cruise, 1985)

Factor 3 – Test and Class Anxiety – There was no significant difference with regard to this factor ($Z = -.41$, $p = .3409$) (Anderson, et. al., 1996). The means and percentiles of the two groups are shown below:

Group	Mean	Percentile
International	24.800	58th
Domestic	24.917	58th (Cruise, 1985)

Factor 4 – Computation self-concept – There is no significant difference between the two groups ($Z = .95$, $p = .1711$) (Anderson, et. al., 1996). The respective means and percentiles are shown below:

Group	Mean	Percentile
International	16.350	62nd
Domestic	15.182	57th (Cruise, 1985)

Factor 5 – Fear of asking for help – There was a significant difference between the means of the international group and the domestic group with regard to this factor ($Z = 3.58$, $p = .000171$) (www.davidmlane.com/hyperstat/z_table.html). The respective means and percentiles are shown below:

Group	Mean	Percentile
International	10.750	82nd
Domestic	8.167	58th (Cruise, 1985)

Factor 6 – Fear of Statistics Teacher – There were no significant differences with regard to this factor ($Z = -.36$, $p = .3594$) (Anderson, et. al., 1996). The respective means and percentiles are shown below:

Group	Mean	Percentile
International	11.772	59th
Domestic	14.318	76th (Cruise, 1985)

CONCLUSIONS

The international and domestic groups differ on three of the six factors identified by STARS. The differences between groups on Factor 5 – Fear of Asking for Help – and Factor 2 – Interpretation Anxiety - probably stem from communication problems. International students are communicating in, at best, their second language. The results of Factor 5 – Fear of Asking for Help – are country specific. Students from Central America and Japan, for instance, behave quite differently when they have a question. The difference noted in Factor 1 – Worth of Statistics – is interesting as the international group has significantly less anxiety with regard to this factor. It appears that the international students have a better grasp of the importance of statistics. It should be noted that a similar study with international students and business statistics found significant differences on two of the same factors, Factor 2 and Factor 5 (Bell, 2008).

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