Statistics Anxiety among Psychology Graduates: An Analysis

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Abstract. The present study was conducted on 66 Gradates of psychology, from University of Karachi, to test the hypotheses that i) The higher the score on Statistics Anxiety, the lower will be the Marks in Statistics Examination, ii) Students who feel comfortable in doing mathematical calculations will score less on Statistics Anxiety as compared to those who do not feel comfortable & iii) Students who feel comfortable in using scientific calculators will score less on Statistics Anxiety as compared to those who feel uncomfortable in using it. On the day of statistics examination, when the students finished their paper, they were asked to voluntarily participate in the study, by filling in a demographic information sheet along with Statistics Anxiety Scale (SAS; Vigil-Colet, et.al, 2008), containing three domains of Statistics Anxiety; i.e., Examination Anxiety, Asking for Help Anxiety and Interpretation Anxiety. Their actual examination marks were also taken after the result was announced. For hypothesis testing, Pearson's correlations and t-tests were applied. Results of the study verified the first and the second hypotheses. However, on the third hypothesis, the result was statistically significant for only one domain of SAS, i.e., Examination Anxiety.

Keywords: Statistics Anxiety, Examination Anxiety, Asking for Help Anxiety, Interpretation Anxiety, Marks in Statistics Examination.

1. Introduction

Statistics has always been an anxiety provoking subject for social sciences students. Mostly students choose non science subjects with an intention to avoid mathematics or calculation however they have to face statistics as a subject sooner or later. About 80% of social and behavioral sciences students experience statistics anxiety (Onwuegbuzie & Wilson, 2003). Statistics anxiety is defined as a specific anxiety that arise when taking a statistical course or by working with statistical analysis which includes gathering, processing and interpreting the data (Cruise et al., 1985).

Statistics anxiety can negatively affect student's performance and his overall psychological and physiological condition. Research revealed some psychological symptoms such as depression, frustration, panic, and worry, observed in students expressing their concerns over statistics anxiety along with physiological signs of headaches, muscle tension, perspiration, and "feeling sick" (Onwuegbuzie et al., 1997).

This statistics anxiety can have drastic effects on the students. They can experience deterioration in their performance in statistics class, and they can also experience inadequate feelings along with low self efficacy in activities related to statistics. It has also been linked with the performance not only in statistics course but also with research courses (Zanakis & Valenza, 1997), further it can be a determinate of student's completion of their degrees (Onwuegbuzie, 1997). It hampers one's ability to understand research articles, data analysis and interpretation of analysis (Onwuegbuzie, 1997).

Another anxiety which has been related to statistics anxiety is math anxiety (Onwuegbuzie et al. 1997) however some researchers consider both as two separate entities (Cruise et al., 1985; Onwuegbuzie et al. 1997; Zeidner, 1991). Manipulation of numbers define math anxiety whereas statistics anxiety includes additional factors like interpretation anxiety of data and statistical outcomes, fear of asking for help, and fear of statistics teachers. Statistics is closely related to verbal and logical reasoning than mathematical reasoning (Cruise et al., 1985).

The present study was designed to see whether the anxiety that students of Social Sciences, especially Psychology feels, pertaining to the course of Statistics, is related with their marks in statistics examination. Majority of the students of Psychology get upset when they find out that they have to study Statistics and feel

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that they have to study mathematics again. Most of these students have studied mathematics as a subject in their 9th or 10th year of education. So anxiety generally begins with just the introduction of this subject. Further, at this level, the course content requires students to do manual calculations, by putting values in formulas and solving it. So it requires them to know basic rules of mathematic, and how to use scientific calculators. So an additional purpose of this study was to compare the anxiety of those who feel comfortable in doing mathematical calculations with those who do not. Also anxiety will be compared between those who feel comfortable with using scientific calculators and those who do not. Following hypotheses were constructed in the light of above review:

- The higher the score on Statistics Anxiety, the lower will be the Marks in Statistics Examination.
- Students who feel comfortable in doing mathematical calculations will score less on Statistics Anxiety as compared to those who do not feel comfortable.
- Students who feel comfortable in using scientific calculators will score less on Statistics Anxiety as compared to those who feel uncomfortable in using it.

2. Method

2.1. Participants:

The participants in this study were 66 regular major psychology students from post graduate program in University of Karachi. There were 9 men and 57 women. The participants' age ranged from $18 - 30$ years ($\bar{x} = 22.41, SD = 3.305$). All the participants belonged to similar grade level (i.e. 15th year of education) in Psychology department, since the compulsory course of statistics is introduced at this level of education in Psychology degree program. The statistics course teacher was same for all, therefore, the style of teaching, the level of course, content of the course and nature of examination was same for all the participants.

2.2. Measures:

Demographic Information Sheet: Demographic Information sheet contained questions about age, gender and grade level. Further, the participants were asked how comfortable they felt in doing mathematical calculations, and how comfortable they felt in using a scientific calculator.

Statistics Anxiety Scale(SAS) (Vigil-Colet, et.al., 2008): Statistics Anxiety scale is a 24 item self-report scale developed to measure statistics related anxiety in Spanish (English version is also available). Along with overall anxiety students experience when taking statistics course, it measures three different dimensions of the anxiety: i) *Examination Anxiety (EA)* measuring anxiety when taking statistics exams, ii) *Asking for Help Anxiety (AHA)* measuring anxiety when asking the course teacher, another student, or a private teacher questions about statistics & iii) *Interpretation Anxiety (IA)* measuring anxiety when they have to interpret statistical data and understand the formulation used in statistics. Inter-factor correlation matrix was calculated and the three dimensions were found to be correlated with each other. This suggested that the three dimensions could be considered as related subscales from an overall scale. To validate SAS, the correlations suggested that all the subscales were related to *Trait Anxiety (p<0.05 & p<0.001)*. However, only *Asking for Help Anxiety* and *Statistical anxiety* were related to *Neuroticism*.

2.3. Research Procedure:

All the participants were regular students of Major Psychology first year post graduate level, University of Karachi. The current study was conducted on the day of statistics examination. After the students had completed their examination paper, they were asked to voluntarily participate in a research project. All those who volunteered were required to fill the demographic information sheet along with the Statistics Anxiety Scale (SAS; Vigil-Colet, et.al, 2008). The researcher was available to handle any queries or questions from the participants. After the questionnaires were filled, the participants were thanked for their participation. When their statistics exam result was announced, the actual marks of all those students who participated in the research project were taken in data.

3. Results

Table 1: Bi-variate correlations of SAS and its dimensions with Statistics examination marks

Variables	1	2	3	4
Examination anxiety				
Asking for help anxiety	.480**			
Interpretation anxiety	.419**	.628**		
Statistics anxiety	.803**	.852**	.800**	
Marks in examination	.007	-.551**	-.313*	-.332*

** p<.001, * p<.01

Table 2: t-test analysis showing differences in SAS and its dimensions among students who feel comfortable or uncomfortable with mathematical calculations.

Variables	Comfort with mathematical calculations	N	Mean	Std Deviation	df	t
Examination Anxiety	Yes	32	24.34	7.589	64	3.414**
	No	34	31.00	8.213		
Asking for Help Anxiety	Yes	32	19.09	6.140	64	3.117**
	No	34	24.65	8.127		
Interpretation Anxiety	Yes	32	21.12	5.774	64	3.792***
	No	34	26.65	6.040		
Statistics Anxiety	Yes	32	64.59	16.150	64	4.360***
	No	34	82.29	16.788		

** p<.01, ***p<.001

Table 3: t-test analysis showing differences in SAS and its dimensions among students who feel comfortable or uncomfortable in using scientific calculator.

Variables	Comfort with calculator	N	Mean	Std Deviation	df	t
Examination anxiety	Yes	53	26.7	8.778	64	2.119*
	No	13	32.15	5.942		
Asking for Help Anxiety	Yes	53	21.68	8.066	64	0.583
	No	13	23.08	6.144		
Interpretation Anxiety	Yes	53	23.91	6.576	64	0.161
	No	13	24.23	6.392		
Statistics Anxiety	Yes	53	72.28	19.520	64	1.264
	No	13	79.54	13.507		

* p<.05

4. Discussion

Hypothesis 1: The higher the score on Statistics Anxiety, the lower will be the Marks in Statistics Examination.

Results of the present study showed moderate negative and statistically significant correlation between the two variables. Further, moderately negative relations were found between Interpretation Anxiety and exam marks, and strong negative relationship was found between Asking for Help Anxiety and exam marks. It shows that if asking for help anxiety is higher it would affect student's performance on statistical exam and decrease examination marks and vice versa. This might be the case due to many reasons. First of all asking

for help might be an embarrassing feeling for some students. They avoid taking any help in statistics because of the feeling of being ridiculed or looked down upon by their peers (Edwards, et.al, 2010; Carretero-Dios, et.al, 2010). It would result in gaps in their knowledge and which in turn negatively affects their performance in the statistics examination. Another reason might be that they feel too anxious to ask for help generally and when it comes to overall statistical anxiety they are too overwhelmed and do not even think about taking help (Wilson, et.al, 2007). The examination at this level requires students not only to do the calculation but also interpretation of results. So this anxiety directly interferes with their exam marks. Overall statistics anxiety lowers performance of students, which further increases their anxiety. Research suggests that statistics anxiety involves a complex array of emotional reactions which hinder the learning process (Onwuegbuzie & Daley, 1999).

Hypothesis 2: Students who feel comfortable in doing mathematical calculations will score less on Statistics Anxiety as compared to those who do not feel comfortable.

Results of the present study support the above mentioned hypothesis and significant differences have been found on SAS and all of the domains of SAS between those who felt comfortable in mathematical calculations, and those who do not. People comfortable with mathematical calculation generally feel command over the problem solving and number handling would also feel confident when working with statistical variables handling. This confidence in mathematical calculation would also generally decrease the overall exam anxiety and would help to perform better in exam settings. Research also support that lack of mathematical skills is one of the main reasons for anxiety in the statistics (Baharun, & Porter, 2009).

Hypothesis 3: Students who feel comfortable in using scientific calculators will score less on Statistics Anxiety as compared to those who feel uncomfortable in using it.

Results of the present study did not support the above hypothesis that statistics anxiety would be low in those with comfort in using scientific calculator. However comfort with using calculator only significantly lowered Exam Anxiety. Using calculator would help in data handling and calculation but statistics anxiety involves more than just data calculation like interpretation of data. So just merely comfort in using calculator would not be helpful in overall reduction of statistical anxiety, however it could help to reduce the exam anxiety. Having some aids during examination generally provides an extra comfort and feeling of command, so when one is confident over calculator use it would help him in overall reduction of exam anxiety (Stickels & Dobbs, 2007, DeVaney, 2010).

On the whole the study did show that statistics anxiety is significantly correlated with examination marks. Also it can be seen that comfort with the use of a scientific calculator reduces exam anxiety, whereas comfort with mathematics reduces overall the statistics anxiety as well as its domains. In future, mathematic anxiety among social science students can also be measured along with their aptitude and attitude towards both mathematics and statistics as a subject.

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