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The Relationship between Test Anxiety and Academic Achievement

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Abstract

The major aim of this research study was to explore the relationship between test anxiety and academic achievement of students at the post graduate level. A sample of 414 students was randomly selected from seven different science departments in a public sector university in Lahore, Pakistan. Data were collected by using the Test Anxiety Inventory (TAI) developed by Spielberger. Pearson correlation, multivariate statistics and regression analyses were run for data analysis. It was found that a significant negative relationship exists between test anxiety scores and students' achievement scores. Results showed that a cognitive factor (worry) contributes more in test anxiety than affective factors (emotional). Therefore, it is concluded that test anxiety is one of the factors which are responsible for students' underachievement and low performance but it can be managed by appropriate training of students in dealing with factors causing test anxiety.

Introduction

Tests and examinations at all stages of education, especially at higher education level have been considered an important and powerful tool for decision making in our competitive society, with people of all ages being evaluated with respect to their achievement, skills and abilities. Zollar and Ben-chain (1990) have the opinion that "the era in which we live is a test-conscious age in which the lives of many people are not only greatly influenced, but are also determined by their test performance". Test and examination stress is thought to prevent some individuals from reaching their academic potential. It has been found that students consistently perceive examination as a source of increase in anxiety and a situation engulfed with uncertainty/unfairness in letting them demonstrate their true achievements (Zollar & Ben-chain, 1990; Spielberger, 1985). Such feelings among students' limit their potential performance during the test situation, resulting in higher text anxiety (Hill & Wigfield, 1984) directly causing drop in the student achievement. Therefore, it can be seen as a measurement error towards measuring student achievement as tests are not meant to measure student achievement under intimidating situation but to know their level of

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achievement in an environment fair enough to let them demonstrate their abilities to the fullest. The researchers have suggested various means to minimize test anxiety with managing external factors like environment of examination hall; behaviour of examiners etc. internal factors like organization of questions in a test, sufficient description of the context, clarity in instruction for students etc. Despite these measures to minimize test anxiety it is generally agreed that it has become most upsetting and a disruptive factor for students. There are number of researches reporting text anxiety as one of the major cause for students' underachievement and low performances at different levels of their educational life (Oludipe, 2009) and has been shown to affect students' ability to profit from instruction (Schonwetler, 1995).

It is worth discussing some studies showing the statistically significant inverse relationship between test anxiety and students' achievement since long time. Gaudry and Spielberger (1971) discussed that high test anxiety is considered as one of the main factor for low performance of students at university level. A study conducted by Nicholson (2009) to explore the effects of test anxiety on student achievement of grade 11 students, revealed that anxiety and achievement are related to each other. Khalid and Hasan (2009) conducted a study on a purposively selected sample of 187 undergraduate students to explore the relationship between test anxiety and academic achievement and found that students with academic achievement have low test anxiety scores and vice versa. Chapell, Blanding, Takahashi, Silverstein, Newman, Gubi, and McCann (2005) conducted a research study to explore the relationship between test anxiety and academic performance. They collected data from a large sample of graduate and undergraduate students and found a significant and negative relationship between test anxiety and academic achievement.

Hancock (2001) investigated the effects of students' test anxiety and teacher's evaluation practices on students' achievement and motivation at post the secondary level**.** He found statistically significant results which revealed that all students, especially students with high anxiety level**,** performed poorly and were less motivated to learn. Thus he concluded that that when students who are particularly test-anxious are exposed to a highly evaluative assessment environment in their educational institution, they perform poorly and are less motivated to perform (Hancock, 2001). A research study conducted by Cassady & Johnson (2002) "to investigate the effect of cognitive test anxiety on students' academic performance and found that cognitive test anxiety exerts a significant stable and negative impact on academic performance measures".. Albero, Brown, Eliason & Wind (1997), on the basis of their research study, concluded that students having high test anxiety had significantly lower scores. Oludipe (2009) conducted a study to explore how test anxiety affects students' performance levels in the sciences, especially in Physics, and concluded that "low test-

anxious students performed better than high test-anxious students on both numerical and non-numerical tasks in Physics". On the other hand, Schonwetter, (1995) by relating this phenomenon to classroom instruction, the researchers further discussed "how high test- anxious students were unable to benefit directly from organized instruction, which ultimately affected their performance in class".

Several researchers explored gender differences with respect to test anxiety and found that females have higher levels of overall test anxiety than males (Chapell et al., 2005; Cassady & Johnson, 2002; Bandalos et al., 1995; Mwamwenda, 1994). Cassady & Johnson, (2002) explained "that one explanation for differences in test anxiety on the basis of students' gender is that males and females feel same levels of test worry, but females have higher levels of emotionality". Zeidner (1990), on the basis of his research, concluded that difference in test anxiety scores of male and female is due to gender difference in scholastic ability.

It is quite evident from the arguments given above and results of the studies reported that text anxiety affects achievement along with other variables such as motivation to learn, ability to benefit from formal instruction and gender. This diversification of effects of text anxiety lead researchers to think of text anxiety as at least bi-dimensional construct (Berk & Nanda, 2006; Chapell et al., 2005; Cassady & Johnson, 2002; Diaz, 2001) with affective and cognitive components. The affective dimension (emotionality) refers to behavioural or physical reactions to testing situations, such as fear, nervousness, and physical discomfort (Hanckock, 2001; Pintrich & Schunk, 1996; Williams, 1994). This high level of emotionality is evident through physiological responses experienced during evaluative situations (Cassady & Johnson, 2002). The cognitive dimension (worry) refers to cognitive concerns about performance, such as worry about the testing situation or negative performance expectations (Humbree, 1988; Morris, Davis, & Hutchings, 1981; Depreeuw, 1984) .It is the cognitive aspect of test anxiety which has been significantly accounted for declines in academic achievement of adolescents and postsecondary students (Bandlos, Yates, & Thorndike-Christ, 1995; Williams, 1991; Humbree, 1981).

The discussion above has intrigued researchers to investigate text anxiety as a contributing factor in student achievement among Pakistani students in institutions of higher education as it is generally perceive that institutions of higher education in Pakistan have very rigid system of tests/examination having high stakes in students' academic career. The study addressed following questions to pursue the above stated broader objective.

1. Determine the relationship between the Test Anxiety total scale scores and academic achievement scores of students in different science subjects.

2. Determine the relationship between the Test Anxiety Emotional scale scores and academic achievement scores of students in different science subjects.
3. Determine the relationship between the Test Anxiety Worry scale scores and academic achievement scores of students in different science subjects.

Research Methodology

This study being a descriptive in nature utilized survey techniques. This section will describe sample, research instrument and procedure of the data collection.

Sample

Seven departments were randomly selected from the science faculty of a public sector university in Lahore, Pakistan**.** From each selected department; intact classes were used in the sample. As a result, sample comprised of 414 randomly selected post graduate students (Male = 116, Female = 298). The detail distribution of sample is given in table 1.

Table 1
Detail of sample of the study

Department	Number of Students		
	Male	Female	Total
Environmental Sciences	8	20	28
Geology	24	02	26
Mathematics	16	54	70
Physics	36	26	62
Science Education	10	47	57
Statistics	22	80	102
Zoology	0	69	69
Total	116	298	414

Research Instrument

There are several instruments developed by various authors for measuring test anxiety but they all use text anxiety as unitary construct. Thus they insist on finding a unitary number representing text anxiety level of students. As mentioned earlier in this paper that this research is based on assumption that test anxiety is at least bi-dimensional construct comprising of emotionality and worry scale. Thus, researchers preferred using Test Anxiety Inventory (TAI) to capture the bi-dimensionality of the selected construct. The same argument is put forward by the Smith (2000) while using this instrument for his study. He compared different test anxiety scales (Test anxiety scale by Sarason, 1978; Test anxiety questionnaire by Mandler

& Sarson, 1952; and the State-trait anxiety inventory by Spielberger, Gorsuch, & Luschene, 1970) to conclude that they yield global test anxiety scores that combine components, emotionality and worry, of test scores". Whereas, as discussed above, researchers considered test anxiety, a bi-dimensional construct, and when someone intends to study the influence of test anxiety on academic achievement, it is necessary to study both components of test anxiety because of the fact that these both factors are related to academic performance (Berk & Nanda, 2006; Chapell et al., 2005; Cassady & Johnson, 2002; Hanckock, 2001; Smith, 2000; Pintrich & Schunk, 1996; Bandlos, Yates, & Thorndike-Christ, 1995; Williams, 1994; Williams, 1991, & Humbree, 1981).

Table 2
Description of sub-constructs, their scope, number of items, example items and reliability of research instrument

Sub-construct	Scope	No of items	Example item	[1]Reliability range (α)	[2]Reliability (α)
Emotionality	Behavioural or physical reactions to testing situations, such as fear, nervousness, and physical discomfort.	8	2. While taking examination I have an uneasy upset feeling	0.85 to 0.91	0.767
Worry	Cognitive concerns about performance, such as worry about the testing situation or negative performance expectations.	8	6. The harder I work at taking a test the more confused I get.	0.83 to 0.91	0.720
TAI total	General feeling about the test anxiety in addition to items already included in emotionality and worry scale. The Test Anxiety Inventory) TAI total score.	20 (16+4*)	13. During important tests I am so tense that my stomach gets upset.	0.92 to 0.96	0.868

[1]as reported in other studies [2]as reported found in this study *There were four items in the scale not included in any sub-construct but were part of the Total score.

Chapell, Blanding, Takahashi, Silverstein, Newman, Gubi, and McCann (2005) reported that test anxiety inventory is extensively used to explore students test anxiety at different levels of education all over the world. Table 2 shows that TAI comprised of 20 Likert Scale type self-report items (Four point scale: indicating from "Almost never" to "Almost always") which are designed by its author (Spielberger, 1980) to measure test anxiety symptoms. The scale is further divided into two subscales: Worry Scale (8 items)**,** and Emotional Scale (8 items). Cronbach alpha (α) reliability

coefficient reported for total scale (TAI-Total) ranged from 0.92 to 0.96 and for its two sub-scales: Worry scale (0.83 to 0.91) and Emotional scale (0.85 to 0.91). For present study, the Cronbach Alpha (α) for total scale was 0.868**,** while the reliability for emotional scale items was 0.767 and for worry scale items was 0.720. The difference in the reliability found in other studies and present study is due do difference in sample size as reliability is directly proportional to number of subjects in sample. Despite difference in reliability on each sub-scale the values of alpha (α) are reasonably high and statistically acceptable.

To collect information about demographic variables, a Demographic Variables Information Proforma was developed by the researchers. It was comprised of information regarding a student's gender, department, semester and achievement scores (Achievement scores were verified by the officials of concerned departments).

Procedure of Data Collection

The data was collected personally by the researchers with prior arrangement with the department concerned and teachers. Intact classes were used for this purpose. To avoid any measurement related error, standardization of procedure was insured by giving uniform instruction to students, each time the data was collected. Similar instruction, environment, and execution timing was provided to students in each department during data collection. The consent of the participants, privacy of information collected and other ethical sureties were provided to the participants.

Analysis and Interpretation of Data

Data were analysed by using SPSS-15 Software Package. Descriptive statistics in table 3 were to provide an understanding of the dimensions of data while inferential analysis focused on finding the relationship of emotionality scale, worry scale and TAI total score with student achievement as described in research questions.

Table 3 exhibited the descriptive values for Emotionality scale scores, Worry scale scores, Total test anxiety scale scores and achievement scores for male and female students in different departments. It is evident from table that for emotionality component, mean value is ranging between a minimum of 15.36 for male students of department of Statistics to a maximum of 20.00 for female students studying in department of Mathematics. Similarly, female students of department of Statistics possess a minimum mean score of 16.16 on worry aspect of test anxiety to a maximum of 20.31 for male students of Mathematics department.

Table 3
Descriptive statistics by department, gender, test anxiety sub-scales and student achievement

Department/ Gender		Emotionality		Worry		Total TA		Achievement	
		Mean	SD	Mean	SD	Mean	SD	Mean	SD
Mathematics	Male	19.94	6.38	20.31	6.15	49.06	14.43	63.42	10.68
	Female	20.00	6.55	20.18	6.01	48.94	14.21	63.54	10.31
Physics	Male	17.19	4.84	17.47	4.87	42.86	10.39	68.49	9.28
	Female	16.92	4.71	17.34	4.87	42.57	10.44	68.80	9.30
Statistics	Male	15.36	4.38	16.27	4.74	38.91	10.75	69.68	8.56
	Female	15.32	3.99	16.16	4.60	40.62	10.84	70.43	8.66
Geology	Male	15.29	4.05	16.45	4.08	44.41	9.91	68.86	5.52
	Female	16.00	1.41	19.50	0.70	40.00	5.65	73.66	10.37
Zoology	Male	-	-	-	-	-	-	-	-
	Female	17.13	4.64	18.05	4.35	43.57	7.44	69.48	7.13
Environmental	Male	16.37	2.72	17.12	2.16	40.12	5.74	73.00	6.27
Science	Female	17.55	3.92	18.85	4.59	41.95	9.29	69.80	7.78
IER	Male	15.50	1.58	16.80	1.22	41.50	10.38	71.00	3.16
	Female	16.49	4.13	16.65	3.05	42.68	9.34	66.88	5.60

On total test anxiety scale scores, the mean value is ranging between a minimum of 38.91 for male students of department of Statistics to a maximum mean score of 49.06 for male students of department of Mathematics. With respect to students achievement scores, male students of department of Mathematics are at lowest level (mean=63.42) to a maximum of 73.66 for female students of Institute of Geology.

Table 4
Relationship between students' achievement scores and scores on test anxiety scale (Total scale, Worry Scale and Emotional scale)

Aspect	N	Pearson r	Significance
Total scale scores and achievement scores	414	- 0.653*	0.000
Worry scale scores and achievement scores	414	- 0.694*	0.000
Emotional scale scores and achievement scores	414	- 0.663*	0.000

It is evident from table 4 that a strong negative and significant relationship exists between students' achievement scores and Total scale scores as well as on subscales scores. It is also found that achievements is significantly inversely related to both emotional and worry scales as well. The magnitude of the relationship is slightly higher on worry scale as compared to emotionality scale and total score. The range of relationship of each scale is more than 65% which is quite strong in magnitude. This stronger relationship encouraged to further analysis to explore the possibility of test anxiety as a predictor of students' achievement. Therefore, a Regression analysis was run to explore the cause- effect relationship between achievement scores and test anxiety scale scores. The result is given in table 5.

Table 5
Regression analysis

Model	β	t-value	Significance	Model R square
Total anxiety scale scores	-0.251	-0.6.700	0.000	
Worry scale scores	-0.697	-0 4.160	0.000	0.535
Emotional scale scores	-0.140	-0.890	0.374	

Table 5 shows that 53% of variance is explained by the regression model which shows that test anxiety affects students' achievement. It is further evident from the table that the worry scales scores are the major contributor with respect to the difference in students' achievement scores.

Table 6
Effect of gender on sub-scales of test anxiety

Multivariate Results				
Test	Value	Hypoth. df	F	Significance
Wilk' Lambda	0.874	2.000	29.567	0.000
Univariate F –Tests				
Variable		df	F	Significance
Emotional sub-scale		1	29.569	0.000
Worry sub-scale		1	0.085	0.771

It is evident from table 6 that F-value (29,567, df = 2.000, p=0.000) is significant both for multivariate test and also for univariate dimension on emotionality component on the basis of students' gender. However, for worry aspect of test anxiety scale, the difference between male and female students is not significant.

Conclusion and Discussion

Keeping in view the focus of the study to find the relative relationship of student achievement with affective and cognitive factors of test anxiety, the results revealed that cognitive factors (worry scale) are pivotal in generating anxiety in students more that affective (emotionality) factors. This finding was of interest as it is in line with the findings of the studies reported in literature (Chapell et al., 2005; Cassady & Johnson, 2002; Birenbaum & Nasser, 1994) and it diminishes the assumption that test anxiety is a function of the stakes involved in a test score. It was assumed that tests in Pakistani higher education institutions were more structured and rigid in structure, thus causing greater test anxiety as compared to students in countries where exams/test formats are relatively flexible. The students feel equally anxious with every test they are asked to take.

Moreover, it is reiterated through these results that pressure of scoring high on tests, fear of passing a course, consequences of failing in test and incompatibility of preparation for test and demand of test were the reason for

cognitive text anxiety. This showed the complexity of thinking process student go through while preparing for tests. This increases as they think more into the consequences or implication related to the achievement in tests. Worrying about a test cannot be regarded as negative phenomenon as a certain level of anxiety contributes positively in successful performance of a test but it accumulates into a negative force when student enters into a cyclic, non-productive process of speculating outcomes based on consequences of the test scores. It is possible to guide students to avoid getting indulged into thinking cycle letting anxiety take over their actions. Teachers, parents and peers can be considerable help for students to keep them motivated to perform better without unnecessarily letting the anticipated consequences of failure taking over the positive force bringing performance of student compatible with their abilities and skills.

Although cognitive aspects are seen as greater reason of text anxiety but emotional (affective) factors also contribute reasonably. The feeling student experience on or before the text also make him/her anxious. As students have reported that they feel uneasy, upset, nervous, tense and panic. These feelings arise irrespective of the extent of preparation of examination on the part of the student; therefore, can be assumed as not specific to tests, but anxiety we all experience during any unseen endeavour of life we go through. Students can be trained to minimize affective test anxiety by providing opportunities to handle unforeseen problem situations and letting them experience test situation more often.

It is evident that feelings (affective) and worry (cognitive) related anxiety are sources of drop in student achievement. Student achievement can be improved by training/educating students about handling stress situations in academic life. If students can manage their emotional anxiety it can assist in improved achievement. Academic programmes in institution of higher education should also focus on grooming students in skills to stabilize their emotional response to potentially difficult situations like tests. The faculty can benefit from popularly used techniques to handle both cognitive and emotional anxiety among students.

Erbe (2007), Berk & Nanda (2006), Stober (2004), Haris & Coy (2003), Foster, Paulk, & Dastoor (1999), Kondo (1996), and Serok (1991) discussed various measures and strategies which can be applied by faculty members to reduce test anxiety among their students. The strategies which can be contextually relevant and useful for teachers in Pakistan can be; task orientation and preparation, positive thinking, seeking social support, avoidance, relaxation training, coaching/ guided imagery, self-instructional training, establishing purpose, affirmation, modalities, positive Anchors, mental simulations, use of humour, preparation of cheat sheet and study skills training.

To summarize this discussion, it is concluded that we live in a test-taking society and that when students are anxious before and during tests,

test anxiety has a significant and effective impact on their performance. To effectively manage test anxiety, students can be helped by teachers, parents and educational administrators through use of cognitive, affective and behavioral strategies. It is further suggested that the students should be fully informed by the faculty and administration of departments about the nature of courses, duration of the semester, and level of commitment necessary for the successful completion of the course. The students with higher test anxiety must be identified and treated in order to increase their academic achievement.

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