RELATIONSHIP OF TEST ANXIETY WITH STUDENTS’ ACHIEVEMENT IN SCIENCE

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ABSTRACT

This research was conducted to explore the relationship of secondary and higher secondary school students’ test anxiety and their achievement in the subjects of science i.e. Physics, Chemistry, Biology and Mathematics. Test Anxiety Inventory (TAI) was used to measure students’ test anxiety. Data was collected from a sample of 1,885 secondary school science students studying Physics, Chemistry, Biology, and Mathematics at 10th grade. Simple correlation (r) and standardized regression coefficients (β) were used to investigate the relationships between test anxiety and achievement in science. The results of the study indicated that test anxiety was significantly negative with total achievement scores of all the four science subjects. High test anxiety caused lower achievement scores. Similarly, the Test Anxiety had significant but negative relationship (p < 0.01) with Physics, Chemistry, Biology, and Mathematics achievement measure for simple correlation analysis.

KEYWORDS: Test Anxiety, Achievement in Science, Test Anxiety Inventory (TAI)

INTRODUCTION

Most students have to face different situations of anxiety during the examination. In the viewpoint of Sarason and Stoops (1978), there are negative and adverse effects of anxiety on the achievement of students during their examinations. Sometimes the students get lower achievement in the examinations. It doesn’t mean that they are less intelligent, perhaps it happens due to the test anxiety. Einat (2000) has explained that highly-test anxious students are often worried due to test situation. They are always in the situation of thinking negative thoughts and consequently their achievement becomes lower. Zeidner (1998) has expressed that “there are many factors like cognitive, affective, motivational, somatic and environmental factors, along with test anxiety, which affect students’ achievement” (p. 235). Woolfolk (2004) has described that:

“Test anxiety has interference on three points: focusing attention, learning, and testing. The students have to pay attention while they are learning new material. Highly anxious students divert their attention between this new material and tension. As a result, the achievement of anxious students becomes lower” (p. 366).

In the viewpoint of Kaya (2004), The major factor which has influence on achievement in science is test anxiety. This factor has created interest in science educators, counselors, psychologists and researchers. Test anxiety has influenced the students and peoples in each and every field of life. Many research studies are present which indicate the effects of test anxiety on achievement in science (Nicholson, 2010; Peleg, 2009; Putwain, 2008 a; Putwain, 2008 b; Chapell, Blanding, Silverstein, Takahashi, Newman, Gubi, & McCann, 2005; Kaya, 2004; McDonald, 2001; Hancock, 2001; Xin, 1999; Hong, 1999). In order to improve students’ achievement in science, a thorough understanding of factor of test anxiety
affecting students’ achievement in science was necessary, so the problem to be investigated in this study was “Effect of Test Anxiety on Students’ Achievement in Science.”

REVIEW OF RESEARCH STUDIES ON TEST ANXIETY AND ACHIEVEMENT

Hill and Wigfield (1984) concluded from past researches that 25% of American students at primary and secondary level had higher test anxiety and lower achievement. Hunsley (1985) conducted a research on test anxiety and academic performance. Undergraduate students were selected in the sample. The test anxiety questionnaire was used as instrument immediately before and after each examination. The results of the study declared that the correlation of test anxiety with academic performance was significantly negative. Highly test anxious students achieved lower examination scores and low test anxious students achieved higher examination scores.

Different studies were meta-analyzed by Hembree (1988) from different states of America. These studies were previously conducted on elementary, secondary and college level students. After meta-analysis, it was indicated that there was significant negative relationship between test anxiety and academic performance. High test anxiety caused the lower academic performance. Then Hembree (1990) again meta-analyzed 151 studies. He concluded the same results as in his previous meta-analysis that the reduction in anxiety caused higher achievement.

Fincham, Hokoda, and Sanders (1989) conducted a longitudinal study on 82 students of third grade and after two years in fifth grade. The study was conducted to explore the relationship of test anxiety with the academic achievement. The results of the study indicated that test anxiety had no effect on achievement scores. Finally, it was concluded and suggested that test anxiety did not effect on achievement in this age range of students.

Wynstra and Cummings (1990) explored the relationship of science anxiety, test anxiety, and academic achievement. The data was collected from a sample of 101 students of 10th grade through 12th in chemistry classes in public high school in Rockford, Illinois. The Czerniak Assessment of Science Anxiety (Chiarelott and Czerniak, 1987) was used to measure science anxiety of the students and Test Anxiety Inventory (Spielberger, 1980) was used to measure students’ test anxiety. The results of the study indicated that the correlation between Czerniak Assessment of Science Anxiety (CASA) and achievement was non-significant. Similarly, the correlation was also non-significant between CASA and the Worry Subscale of Test Anxiety Inventory (TAI). But the correlation was significant between Czerniak Assessment of Science Anxiety (CASA) and the Emotionality Subscale of TAI. The achievement scores of males were less than the females on CASA.

Mcdonald (2001) reviewed a paper for the literature on test anxiety in school children. He put forward the evidences on the association of test anxiety with the test performance. It was found that the relationship between test anxiety and performance was very strong and test anxiety had strong effect on test performance. It was also concluded that fear of examinations and test situations were widely spread and became more prevalent.

Kaya (2004) conducted a research study to find the relationship of levels of test anxiety with academic achievement of fifth-grade Turkish students in elementary school. In the analysis of data, the relationship between test anxiety and academic achievement was -0.15 (p less than 0.001). It was clear from these results that there was negative effect of test anxiety on academic achievement. The students having high test anxiety had lower achievements and the students having low test anxiety had higher achievements.

Chapell et al. (2005) conducted a research study on undergraduate and graduate students for the investigation of relationship between test anxiety and academic performance. Test Anxiety Inventory was administered (TAI) to measure
students’ test anxiety and their performance was measured from their Grade Point Average (GPA). It was indicated from the results of the study that female graduate students having low test anxiety had higher grade point average and female students having high test anxiety had lower achievement. But the male graduate students with low and high test anxiety had no effect on their performance. In case of female undergraduate students, high test anxiety caused higher grade point average (GPA), but male undergraduate students had lower test anxiety and lower grade point average.

Putwain (2008 a) explored the relationship between test anxiety and academic performance by collecting data from 558 students of 11th grade. These students were selected from different secondary schools in UK. The correlational analysis indicated that there was a small but significantly negative relationship between test anxiety and academic performance. Worry Component of test anxiety scale and academic performance had very strong relationships with each other but Emotionality Component of test anxiety scale and academic performance had weaker relationships. Similarly, Putwain (2008 b) conducted another study to find out the relationship between examination anxiety and examination grades. The data was collected from a sample of 615 students of secondary level. These students were selected from different secondary schools in UK. There were negative correlations of Worry and Emotionality Components of test anxiety with the examination grades. The students having higher scores on Test Anxiety-Worry and Test Anxiety-Emotionality components got lower examination grades. But the students with lower test anxiety scores on both the components got higher examination grades.

Nicholson (2010) determined the effects of test anxiety on students’ achievement. The data was collected from 200 eleventh grade students from a high school. These students were administered Test Anxiety Inventory to determine the levels of test anxiety. The results of the study, after analysis of data, indicated that test anxiety had significant effect on achievement of students.

OBJECTIVES OF THE STUDY

The objectives of the study were: 1) To provide descriptive data related to test anxiety and achievement in science, and 2) to explore the relationship between test anxiety and students’ achievement in the subjects of physics, chemistry, biology and mathematics as well as with the total score of these science subjects.

PARTICIPANTS

The total number of students selected for the sample were 1,885. These students were selected from 64 schools in the Punjab province of Pakistan and they were studying Physics, Chemistry, Biology, and Mathematics as science subjects at secondary level.

INSTRUMENT

In order to measure students’ test anxiety, the adapted and Urdu translated version of Test Anxiety Inventory (TAI: Spielberger, 1980) was used. Test Anxiety Inventory was translated into Urdu language by three different language and content experts and then administered on 1,885. The data was collected by the researcher himself with the permission of heads of all 64 schools.

DATA ANALYSIS

All the relationships were investigated among five measures of students’ achievement (Physics, Chemistry, Biology, Mathematics, and the Total score), single Test Anxiety scale by using the sample of 1,885 science students of 10th
grade selected from 64 schools. The revised versions of Test Anxiety Inventory (TAI) was used to measure students’ test anxiety.

Table No.1 below shows the simple correlation (r), and the standardized regression coefficient (β) for relationships of Physics achievement measures with single Test Anxiety scale.

**Table 1: Simple Correlations (r) and Standardized Regression Coefficients (β) for Relationships of Physics Achievement Measures with Test Anxiety Scale**

<table>
<thead>
<tr>
<th>Scale</th>
<th>Physics Achievement Measure</th>
<th>r</th>
<th>β</th>
</tr>
</thead>
<tbody>
<tr>
<td>Test Anxiety</td>
<td>-0.19**</td>
<td>-0.16**</td>
<td></td>
</tr>
</tbody>
</table>

*P < 0.05, **P < 0.01, N = 1885

Table 1 above shows that Test Anxiety had significant negative relationship (p < 0.01) with Physics achievement measure for simple correlation analysis. The standardized regression coefficients (regression weights) were also examined to interpret the significant multiple correlation.

The investigations of signs for standard weights show that the relationship between Physics achievement measure was negative with Test Anxiety scale. It is concluded from the above discussion that Test Anxiety shows that increasing test anxiety causes lower Physics achievement scores.

Table 2 below shows the simple correlation (r) and the standardized regression coefficient (β) for relationships of Chemistry achievement measures with single Test Anxiety scale.

**Table 2: Simple Correlations (r) and Standardized Regression Coefficients (β) for Relationships of Chemistry Achievement Measures with Test Anxiety Scale**

<table>
<thead>
<tr>
<th>Scale</th>
<th>Chemistry Achievement Measure</th>
<th>r</th>
<th>β</th>
</tr>
</thead>
<tbody>
<tr>
<td>Test Anxiety</td>
<td>-0.20**</td>
<td>-0.15**</td>
<td></td>
</tr>
</tbody>
</table>

*P < 0.05, **P < 0.01, N = 1885

It is indicated from Table 2 that Test Anxiety had significant negative relationship (p < 0.01) with Chemistry achievement measure for simple correlation analysis. It is concluded from the above discussion that negative regression weight for Test Anxiety shows that increasing test anxiety causes lower Chemistry achievement scores.

Table 3 given below presents the simple correlation (r) and the standardized regression coefficient (β) for relationships of Biology achievement measures with single Test Anxiety scale.

**Table 3: Simple Correlations (r) and Standardized Regression Coefficients (β) for Relationships of Biology Achievement Measures with Test Anxiety Scale**

<table>
<thead>
<tr>
<th>Scale</th>
<th>Biology Achievement Measure</th>
<th>r</th>
<th>β</th>
</tr>
</thead>
<tbody>
<tr>
<td>Test Anxiety</td>
<td>-0.19**</td>
<td>-0.15**</td>
<td></td>
</tr>
</tbody>
</table>

*P < 0.05, **P < 0.01, N = 1885

The results shown in Table 3 indicate that Test Anxiety had significant negative relationship (p < 0.01) with Biology achievement measure for simple correlation analysis. However, a negative regression weight for Test Anxiety shows that increasing test anxiety causes lower Biology achievement scores.
Table 4 given below presents the simple correlation \((r)\) and the standardized regression coefficient \((\beta)\) for relationships of Mathematics achievement measures with Test Anxiety scale.

### Table 4: Simple Correlations \((r)\) and Standardized Regression Coefficients \((\beta)\) for Relationships of Mathematics Achievement Measures with Test Anxiety Scale

<table>
<thead>
<tr>
<th>Scale</th>
<th>Mathematics Achievement Measure</th>
<th>(r)</th>
<th>(\beta)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Test Anxiety</td>
<td></td>
<td>-0.22**</td>
<td>-0.18**</td>
</tr>
</tbody>
</table>

*\(P < 0.05\), **\(P < 0.01\), \(N = 1885\)*

Table 4 shows that Test Anxiety had significant negative relationship \((p < 0.01)\) with Mathematics achievement measure for simple correlation analysis. However, a negative regression weight for Test Anxiety shows that increasing test anxiety causes lower Mathematics achievement scores.

Table 5 below shows the simple correlation \((r)\) and the standardized regression coefficient \((\beta)\) for relationships of Total achievement measures with Test Anxiety scale.

### Table 5: Simple Correlations \((r)\) and Standardized Regression Coefficients \((\beta)\) for Relationships of Total Achievement Measures with Test Anxiety Scale

<table>
<thead>
<tr>
<th>Scale</th>
<th>Total Achievement Measure</th>
<th>(r)</th>
<th>(\beta)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Test Anxiety</td>
<td></td>
<td>-0.25**</td>
<td>-0.19**</td>
</tr>
</tbody>
</table>

*\(P < 0.05\), **\(P < 0.01\), \(N = 1885\)*

The total achievement measure was the sum total of scores of all science subjects i.e. Physics, Chemistry, Biology and Mathematics. The data of Table 5 represents that Test Anxiety had significant negative relationship \((p < 0.01)\) with Total achievement measure for simple correlation analysis. The signs of standard weights show that the relationships between Total achievement measure with Test Anxiety Scale was negative. The conclusions drawn from the above discussion that negative regression weight for Test Anxiety shows that increasing test anxiety causes lower Total achievement scores.

**DISCUSSIONS**

The present study indicated that test anxiety was negatively correlated with the achievement in science. The findings of the present study have described that test anxiety of 10th grade science students caused lower achievement in science subjects. The correlation of test anxiety with all of the four science subjects and total achievement scores ranged from -0.19 to -0.25. Although the correlation of test anxiety and achievement measures were not very strong but the results of the present study replicated and verified another study by Kaya (2004) where the correlation was -0.15 \((p < 0.001)\).

The results of this study were also coinciding with the results of some other studies which had indicated that test anxiety was negatively correlated with achievement in science. Highly test anxious students had low academic achievement in science and low test anxious students had higher achievement in science (Nicholson, 2010; Peleg, 2009; Putwain, 2008 a; Putwain, 2008 b; Chapel et al., 2005; Hancock, 2001; Hembree, 1990; Hembree, 1988; Hunsley, 1985; and Hill & Wigfield, 1984). But a few studies indicated the contradictory results that high test anxiety caused higher achievement (Hong, 1999). It is concluded from the above discussion that test anxiety is negatively correlated with the achievement of students in science.
At the end of the discussion, it is recommended that Test Anxiety Inventory (TAI) was carefully translated into Urdu language and then validated and made reliable, so science educators, researchers, scholars and teachers can use these valid and reliable instruments. Similarly, qualitative research should be included which may influence students’ achievement in science. It is also recommended that this study should also be conducted in private sector single-sex schools as well as coeducational schools, so that there should be a comparison about the variables of the study for private and public sector students.

This research was conducted on the students of secondary level only. It is suggested that the same research or any other research similar to this one can be conducted on all levels i.e., from primary level up to university level. Likewise, this research may also be conducted on students taking subjects of arts. So, its results can be generalized for whole of the population including students of science as well as arts.

REFERENCES


