Academic Leadership: The Online Journal

Volume 7
Issue 4 *Fall 2009*

Article 19

10-1-2009

Influence of Test Anxiety on Performance Levels on Numerical tasks of Secondary School Physics Students

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Academic Leadership Journal

Introduction

What is Anxiety?

Anxiety is an aversive emotional experience that motivates individuals to move away from, remove, or control the source of anxiety. It is marked by subjective feelings of tensions and fear, increased physiological arousal, perceptions of danger and risk, decreased cognitive and behavioral performance, and/or avoidance and escape (Deffenbacher & Suinn, 1982; Laug, Levin, Miller & Kozak, 1983; Beck & Emery, 1985). At low levels, anxiety may be motivating and attention focusing; at higher levels, it may become debilitating. The individual may report subjective feelings of anxiety (e.g. tension, dread, fear, nervousness, edginess). He may experience heightened autonomic arousal. Many physical symptoms reflect sympathetic arousal of the "fight or flight" reaction (e.g. increased heart rate, rapid breathing, blushing). Sometimes overlooked is parasympathetic arousal involved in the "faint or freeze" reaction (e.g. dizziness, feeling faint or weak, nausea, frequent urge to urinate). He may also experience an increase in or exacerbation of anxiety – related psycho-physiological disorders (e.g. tension or migraine headaches, ulcerative gastrointestinal conditions, sleep onset insomnia), even though he may be unaware of heightened arousal.

Anxiety may also be inferred from many cognitive and perceptual processes. Example, an anxious person may report sensory – perceptual distortions of non psychotic proportions (e.g. feelings of unreality, objects appearing blurred or distant, the environment seeming somehow unusual). Anxiety may also be reflected in attentional processes. For some individuals, attention does not seem to be under their control (e.g. dazed, unable to concentrate). Others report narrowed attention wherein they focus only on anxiety – arousing stimuli and are unable to shift attention to task – oriented cues (Sarason, 1972; Beck & Emery, 1985).

Anxious individuals are acutely sensitive and responsive to "danger" cues, whether objectively dangerous or not. The nature of danger depends heavily on the individual's vulnerabilities or on what is called vulnerability mode (Beck & Emery, 1985) Example, socially anxious persons are very sensitive to feed back about their behavior and to possible negative evaluation by others (Beck & Emery, 1985). Danger cues may include one's own thoughts and urges (in obsessive – compulsive disorders) or one's worries (in generalized anxiety disorder). The nature of the vulnerability mode is fairly specific to each anxiety concern.

Whatever the danger cues, anxious individuals have their perceptual – attentional processes tuned to real and potential harm, leading them to over- perceive danger and conversely, under perceive safety cues such as internal and external support evidence of positive coping, and intrapersonal and environmental resources for threat prevention and coping (Beck & Emery, 1985; Barlow & Cerny, 1988). Having once over predicted danger and experienced anxiety, anxious individuals are reluctant to risk being unprepared again and continue to over predict threat and anxiety (Rachman & Bichard,

1988). Only after repeated disconfirmations of their anxiety do they adjust their expectations and reduce vigilance for their danger cues.

Cognitive performance and information processing (i.e. associations made to, interpretations made of, and operations performed on information) may reflect anxiety. Examples, anxious individuals show greater difficulty in learning and memory encoding (Mueller, 1980). Memory encoding and retrieval may also reveal interference, such as when a speech – anxious individual forgets portions of a well – rehearsed speech.

What is Test Anxiety?

Test anxiety is the anxiety students exhibit before, during or after test situations. The conditions for the arousal of anxiety in the context of testing are similar to those in other contexts. Test anxiety has distinctive triggers and cognitive components, but the feeling – tone is the same as anxiety in general. The perceived threat of test and test – like situations arises from several sources. These include task difficulty, the formalities of testing, physical setting for the testing and the test's instrumental importance as a hurdle to be overcome. Difficulty refers not only to subject matter or the complexities of questions or test – item constructions, but also to knowledge preparations and level of ability. Anticipated difficulty as a source of anxiety may thus in part be a function of lack of preparation, which is unstable but may have been capable of control personally. On the other hand, difficulty as a consequence of low ability may be stable and beyond personal control.

Test Anxiety and Achievement

Research findings have revealed test anxiety as one of the variables that affect achievement (Julkunen, 1992; Ford, 1995; Schonwetter,1995; Zanakis & Valenzi, 1997). Some of these studies have associated high test anxiety with low achievement. Albero, Brown, Eliason & Wind (1997) found that children with high test anxiety had significantly lower scores. Similarly, Schonwetter, (1995) found that test anxiety yielded differences in student learning outcomes and that high test – anxious students were unable to benefit directly from organized instruction though organized instruction did increase students' motivation to attend future classes.

Several traits have been related to anxiety. Hong, (1999) found that trait 'worry' was positively related to statistics course anxiety, even though statistics course anxiety was found to have no significant effect on statistics achievement. Grimes, (1997) reported that under-prepared students demonstrated higher levels of test anxiety. Also, Julkunen, (1992) found that test – anxious people exhibit traits like worry, tensions, test – irrelevant thoughts, physical reactions (e.g. rapid heartbeat), and fear of failure. Children have been reported to exhibit more stress behaviors during testing than before it as their behavior during testing is not typical of their behavior before and after testing (Fleege, 1992).

Among seven studies of fear of failure, its relations with anxiety remained inconclusive. Herman (1990) on the other hand, constructed a 'fear of Failure scale' which appears to be a good predictor of academic achievement, and of the worry and emotionality components of test anxiety. Fear of failure explained more variance in the achievement variables than emotionality or worry taken separately or together. He concluded that Fear of failure was a salient trait component of test anxiety which in test conditions is manifested as a situational state component. In addition, test anxious students were reported to perceive themselves as being less cognitively and socially competent and expressed more

negative feelings of general self worth.

Still reporting on high test anxiety Dew, Galassi, & Galassi, (1984); reported high test anxiety to be related more to situations where numerical manipulation is required or mathematical problems have to be solved. This he found when he investigated the relation of mathematics anxiety to situational state test anxiety, math performance, physiological arousal, and mathematics avoidance behavior. Their results suggested that mathematics anxiety and test anxiety were related but not identical. To develop more empirical support for the claim that students in general are more test anxious about tests in rigorous academic subjects than in the humanities and to understand the curriculum related sources of anxiety. Everson, (1993) compared college students' self – reported test anxiety levels in English, mathematics, physical science and social sciences. Test anxiety scores and perceptions of subject matter difficulty correlated, independently of the particular subject and the test demands. Analyses of covariance indicated that physical sciences elicited the highest levels of self- reported evaluative anxiety, after controlling for perceptions of difficulty and test demands. Consistent with this was the findings of Williams, (1996). He studied test anxiety among academically talented high school students (n=103), assessing cognitive and psychological components. Results indicated that students suffered from lest anxiety, with higher anxiety related to lower science performance.

Gender disparity in test anxiety has also been revealed by some researchers. Schonwetter (1995) found that low test anxious males showed higher achievement outcomes, perceived more success over their performances, and felt more confident than high test-anxious males or females. Hong, (1999) found that female students reported higher trait test anxiety and statistics course anxiety than did males. This view was corroborated by Rasor & Rasor (1998). He reported that female students are in greater need for help than males with overcoming test anxiety. Female students were reported to experience higher worry than emotionality, while little difference in components was found for males (Williams (1996). In same vein, Nasser & Takahashi (1996) reported that girls had higher test anxiety levels than boys in worry, tension and bodily symptoms but not in test-irrelevant thinking.

Some studies have established no linkage between test performance and test anxiety. Kim & Mclean, (1994) in studying the relationship between individual difference variables and test performance in Computerized Adaptive Testing, considered test anxiety as one of the individual difference variables. He found that test anxiety was not significantly related to test performance. Similarly, Williams (1997) assessed efficacy for self regulated learning, academic performance and test anxiety among junior high and high school students (n=103). Surveys indicated that students who perceived themselves as more capable of self –regulated learning tended to have higher academic achievement, and the association was unaffected by amount of test anxiety. Also, Brown & Nelson, (1983) employed a 2×2 Factorial design in which 2 levels of test anxiety were crossed with 2 levels of academic performance. The results indicated that students in the high academic performance groups (e.g those with high grades) scored higher on measures of academic skills than did students in the low groups regardless of their reported levels of test anxiety.

From the foregoing, it is glaring that research findings on test anxiety has not learnt itself to simple summary. More importantly, there is need to develop more empirical evidence on how test anxiety affects students' performance levels in the sciences especially, Physics. Emphasis is laid on the science of physics in this study because physics is basic to the other science subjects and it's very vital in understanding the complexities of modern technology and myriad of other scientific development

useful to mankind. Some research evidences have documented that Physics students are more test anxious on numerical tasks than non-numerical ones. There is therefore need to develop more empirical support (or otherwise) for this claim, and to compare the test anxiety levels of male Physics students to female physics students.

Hypotheses

1. There is no significant difference between the performance of low and high test anxious students on numerical tasks in Physics.

2. There is no significant difference between the performance of low and high test anxious students on non-numerical tasks in Physics.

3. There is no significant difference between the test anxiety levels of male and female Physics students.

Methodology Subject

The sample consists of 183 SS3 (105 males and 78 females) Physics students (with average age of 15.6 years, SD = 1.68) randomly selected from four secondary schools in Ibadan North Local Government areas of Oyo state.

Instruments

Two instruments were used for data collection. These include: A Physics Achievement Test (PAT) and a Test Anxiety Inventory(TAIN). The PAT, based on numerical problems in physics was developed by the researcher. Originally, the test was made up of 50 items in multiple choice format with four options (one correct response and three distracters). The questions were based on Optics, Heat, Electricity, waves and magnetism topics in Physics. Face and content validity of the instrument were ensured by four physics teachers with not less than 5 years of teaching experience in Physics. Thereafter, the test was trial-tested on 40 SS 3 Physics students in a secondary school in Ijebu- Ode Local Government area of Ogun- State. From the result obtained, the difficulty and discrimination indices of each item was computed. Items with positive discrimination and difficulty (or facility) indices of between 0.45 and 0.65 were retained. At the end, the researcher selected the best 40 items that satisfied these conditions. Reliability estimates of 0.73 was established for PAT using kuder- Richardson formula 20.

The Test Anxiety Inventory (TAIN) was developed by Sokan, (1998). The researcher adapted it for use in this study. It was made up of two sections : The first section (A) seeks demographic information, while section B consists of 20 items on test anxiety arranged besides a 4 -Point (Likert) scale (NT, ST, MT,T) in which the respondents were to indicate the extent to which the statements were true or not true of their test anxiety. It was then presented to 40 SS3 students in a secondary school in Ijebu-Ode local government area of Ogun State for validation. In order to establish the construct validity and internal consistency reliability of the instrument, the cronbach's coefficient alpha was computed by the researcher and it yielded an estimate of 0.75. Sokan, (1985) reported a reliability estimate of 0.85, and a split- half reliability coefficient of 0.75 for the instrument.

Procedure and Data Analysis

The students were made to sit in their classroom under normal classroom conditions. The questionnaires and achievement tests were then administered on all the physics students in a class with the aid of research assistants (who were usually the classroom teachers). The administration of the questionnaires and achievement tests were carried out during the morning hours and it lasted for eighty minutes. After completion, the questionnaires were collected back and scored by the researcher.

Scoring of Instruments and Data Analysis

For the Physics Achievement Tests, each correct item response attracted a score of 1, while zero score was awarded a wrong response. Since the test was not speeded, there was no correction for guessing. The maximum total score was 40 for each of the tests.

For the Test Anxiety Inventory, there were four categories of responses to each item with weighted values of 1 to 4. These categories are weighed to reflect the Intensity of Agreement or disagreement with statements that were most like or least like the test anxiety of the respondent. A score of 1 to 4 was assigned to “Not True” to “True ”. The reverse was the case for items where negative response reflected positive test anxiety. The average weighted mean score was 1.51. Scores above the average weighted mean score reflected high test anxiety towards physics. The average weighted mean score and scores below it reflected low test anxiety.

The data were analyzed using frequency counts and t-test (for testing significant difference in means of two groups) at the 0.05 probability level.

Results Hypothesis 1: There is no significant difference between the performance of low and high test anxious students on numerical tasks in physics.

Table I: t-test analysis of Low and High Test-anxious students on Non-numerical tasks in Physics

Variable	N	Mean	SD	df	t	p	Remark
Low TA	114	29.35	9.82	181	2.531	0.012	significant
High TA	69	26.48	9.47				

From Table I above, the mean score of low test anxious students was higher than that of high anxious students, and this difference was significant. Based on this, the null Hypothesis 1 was rejected. In other words, there is significant difference between the performance of low and test anxious students on non-numerical problems in Physics.

Hypothesis 2: There is no significant difference between the performance of low and high test anxious students on non-numerical tasks in physics.

Table II: t-test analysis of Low and High Test-anxious students on Numerical problems in Physics

Variable	N	Mean	SD	df	t	p	Remark
Low TA	114	22.73	7.28	181	2.769	0.031	significant
High TA	69	18.09	6.15				

From Table II above, the mean score of low test anxious students was higher than that of high anxious students, and this difference was significant. Based on this, the null Hypothesis 2 was rejected. In other words, there is significant difference between the performance of low and test anxious students on numerical problems in Physics.

Hypothesis 3: There is no any significant difference between the test anxiety levels of male and female physics students.

Table III: t-test analysis of test anxiety levels of male and female physics students

Sex	N	Mean	SD	df	T	p	Remark
Male	105	1.39	0.483	181	0.236	0.813	Not
Female	78	1.52	0.492				significant

From Table III above, the mean score of female students was higher than that of male students, and this difference was not significant. Based on this, the null Hypothesis 3 was not rejected. In other words, there is no significant difference between the test anxiety levels of male and female physics students.

Discussion

The first and second findings revealed that low test anxious students performed better than high test anxious students on both numerical and non-numerical tasks in Physics. This finding is in agreement with the findings of Kin & Mc.lean, (1994); Schonwetter(1995); Albero, Brown, Eliason & Wind (1997). For a student to be low test-anxious, such student must prepared well for the test or may be high ability students, or may not perceive the subject as difficult. When a student prepares well for a test through effective studying, he/she is more likely to be more calm and stable, and exhibits less symptoms of anxiety such as tension, dread, fear, nervousness, increased heart rate, feeling faint or weak, frequent urge to urinate, lack of concentration and test-irrelevant thoughts. In addition, such students are more likely to encounter less problems in organizing and encoding relevant information during tests (Naveh-Benjamin, Mc. Keachie, & Lin, 1987).On the other hand, a student who does not adequately prepare for a test, or who views the subject as difficult, or has low ability is more likely to become test anxious and become worried, have test irrelevant thoughts and exhibit some body symptoms that show he /she is tensed up. In their own view, Brown & Nelson, (1983) associated high levels of test anxiety with various indexes of cognitive and somatic distress, differences in study and test taking skills.

Findings also showed that low test anxious students performed better in numerical problems in Physics than high test anxious students. This is in agreement with the findings of Dew, Galassi, & Galassi,

(1984) that high test anxiety is related more to situations where numerical manipulation is required or mathematical problems have to be solved.

The finding that female students reported higher test anxiety than male students was supported by Nasser & Takahashi (1996); Rasor & Rasor (1998); Hong, (1999). However, this was not significant. Several factors could be responsible for high test anxiety in female students. This could range from their negative perception of themselves, their teachers and physics as a subject.

Conclusion and Recommendations

Improving students' performance levels in Physics requires efforts at stemming their test anxiety levels. Part of these efforts may include interventions focusing on the development of effective study behaviors and positive perception of subject matter by students. Also, physics teachers have a vital role to play. For instance, teachers need to know that their personality could influence students' achievement. Research support have linked student learning to variables such as teacher clarity, enthusiasm, task-oriented behavior, variability of lesson approaches, teachers' abilities to structure materials, ask higher-order questions, use students' ideas, and probe students' comments (Darling – Hammond, Wise & Pease 1983; Good & Brophy 1986). Also, studies have linked teachers' verbal ability to students' achievement (Coleman 1966; Bowles' & Levin 1968; Hanushek 1971).

There is need to find out the relationship between students' study skills, perception of subject matter difficulty and their test anxiety levels. Also, there is need to find out whether self-regulated learning could stem students' test anxiety.

References

Albero, P; Brown, A; Eliason, S; & Wind, J. (1997): Improving Reading through the use of Multiple Intelligences. *Master's Action Research. Project*, saint Xavier University & IRI Skylight. U. S.

Barlow, D.H. & Cerny, J.A. (1988): Psychological treatment of Panic. New York: Guildford Press

Beck A.T. & Emery, G (1985): Anxiety disorders & Phobias. Basic Books, New York

Brown, S.D. & Nelson, T.L. (1993): Beyond the uniformity myth: A comparison of academically successful and unsuccessful test anxious college students. *Journals of Counseling Psychology*, 30, 367-374

Coleman, J.S. (1966): *Equality of Educational opportunity*. Washington, DC: U.S. Govt. printing office.

Darling-Hammond, L, Wise, A.E. & Pease, S.R (1983). Teacher Evaluation in the organizational context: a review of the literature. *Review of Educational Research,* 53, 285-237

Deffenbacher, J.L. & Suinn, R.M.(1987): Generalized anxiety syndrome, In. L. Michelson & L.M. Asher (Eds), *Anxiety and stress disorder*: 332-360. New York Guildford Press

Dew, K.M.K; Galassi, J.P.; & Galassi, M.D. (1984): Mathematics anxiety: Relation with situational test anxiety, performance, physiological arousal, and mathematics avoidance behaviour. *Journal of Counseling Psychology* 31:580-583

Fleege, P.O.(1992): Stress Begins in Kindergarten: A look at Behavior during standardized Testing. *Journal of Research in Childhood Education.* 7(1) 20-26.

Ford, D.Y. (1995): A study of achievement and under-achievement among Gifted, potentially gifted, and Average-American students. Storrs, C.T., Virginia university., Charlottesville

Good, T. L. & Brophy, J. E. (1986). Educational Psychology, 3rd edition. NY: Longman.

Grimes, S. K. (1997): Under-prepared Community College Students: Characteristics, persistence, and Academic Success. *Community College Journal of Research & Practice.* 21 (1), 47-56.

Hanushek, E.A. (1971). Teacher characteristics and gains in students' achievement: Estimation using micro data. *The American Economic review*61(2) 280-288.

Hong, E.(1999); Effects of Gender, Mathematics Ability, Trait Test Anxiety, Statistics Course Anxiety, Statistics Achievement, and perceived test difficulty on state Test Anxiety. *Paper presented at the annual meeting of the American Educational Research Association* (Montreal, Quebec, Canada) Nevada, U.S.A.

Julkunen, K. (1992): Trait and Test Anxiety in the FL Classroom. Revised Version of a paper presented at a Teaching Symposium (Helsinki) Finland.

Lang, P; Levin, D, Miller, G.& Kozak, M.(1993): Fear behavior, fear imagery, and the psychology of emotion. The problem of affective response integration. *Journal of Abnormal Psychology* 92, 276-306

Moog, K. & Matthews, A(1990): Is there a self-referent mood-congruent recall bias in anxiety? *Behavior Research and Therapy*, 28, 90-92

Nasser, F & Takahashi, T. (1996). An application of confirmatory factor analysis with item parcels for testing the structure of test anxiety among Israeli-Arab High school students. *Paper presented at the Annual meeting of the national council on measurement in education, Georgia, USA*

Naveh-Benjamin, M.; Mc Keachie, W.J. & Lin, Y.J. (1987): Two types of test anxious students: Support for an information processing model. *Journal of Educational Psychology,* 79, 131-136

Mueller, J.H. (1980): Test anxiety and the encoding and retrieval of information. In I,G, Sarason (Ed.), Test Anxiety: Theory, Research and Applications 63-86, Hillsdale, NJ: Erlbaum

Rachman, S. & Bichard, S. (1988): The over-prediction of fear. *Clinical Psychology Review*8, 303-313

Rasor, L.T. & Rasor, R.A. (1998). Test Anxiety and study Behaviour of Community College students in relation to Ethnicity, Gender and Age. California, USA

Sarason (Ed.), Test Anxiety: Theory, Research and Applications 63-86, Hillsdale, NJ: Erlbaum

Schonwetter, D.J.(1995); An empirical investigation of effective college teaching behaviors and student differences; Lecture Organization and Test anxiety. *Paper presented at the annual meeting of the American Educational Research Association* (San Francisco) Canada

Williams, J.E. (1996): Gender-Related Worry & Emotionality. Test Anxiety for High Achieving Students. Psychology-in-the-Schools 33(2), 159-162

Zanakis, S.H. & Valenzi, E.R. (1997): Student anxiety and attitudes in Business statistics. *Journal of Education for Business*, 73(1), 9-16