

Development and Validation of an Instrument to Measure Test Anxiety among Students

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ABSTRACT: Test anxiety can affect any student irrespective of gender, ethnicity, socio-economic status, grade level or intellectual capacity. The study sought to develop and validate an instrument for measuring test anxiety among students. A sample of 367 respondents (169 females and 198 males) were selected through multi-stage sampling procedures. An Exploratory Factor Analysis using Principal Component Analysis with Varimax (orthogonal) rotation and Eigen Values of 1 were used in the analysis. With this, two factors with the first factor accounting for 60.02% of the variability of the entire set of variables were retained. The KMO and Bartlett's test of Sphericity were used to examine the relationship among the items. The KMO in assessing the sampling adequacy stood at 0.924 with the Bartlett's test of sphericity ($\chi^2 = 4267.666$) being significant ($p = 0.000$). The inclusion criteria which served as the cut-off point was 0.40. After the analysis, 20 items loaded successfully on the main factor. After estimating the reliability coefficient (0.894) of the final 20 items, the study concludes that the items can be used by researchers, counsellors, teachers and other stakeholders to measure students' test anxiety.

KEYWORDS: *Test anxiety, Instrument development and validation, Reliability, Test*

I. INTRODUCTION

Globally, students face the challenge of coping with tests and this is irrespective of grade level (Ringeisen, Buchwald, & Hodapp, 2010). This is because, test results are used to make important decisions about the individual who takes it. Due to the critical nature of testing, students experience uneasiness or apprehension before, during, or after a test (Shokrpour, Zareii, Zahedi, & Rafatbakhsh, 2011). It must be pointed out that test anxiety affects people, of all ages, who have to be evaluated, assessed, and graded on their abilities or achievements. As maintained by Akanbi (2013), test anxiety is an important factor in all levels of education starting from the primary, secondary and tertiary. Fulton (2016) points out that about 10 million elementary and secondary school students experience test anxiety. In a typical classroom of 25 students, between one and three students are at risk of developing test anxiety, including students of average intelligence, students with learning disabilities, and even gifted students (Fulton, 2016). While test takers experience test anxiety, Betrams, Englert, and Dickhauser (2013) stipulate that test takers differ in the levels of test anxiety they experience in that the level of test anxiety can high or low for a particular test taker. Based on this differentiation, Akanbi (2013) stresses that a small amount of anxiety can be good because it acts as motivation and can increase achievement by pushing the students to do their best. Conversely, Casbarro (2005) stipulates that too much anxiety can disturb mental skills needed for students to be successful on tests. The reason might be that students with test anxiety cannot concentrate on test questions which in turn, trigger poor performance on tests. Owing to this, Atasheneh and Izadi (2012) opine that test anxiety is one of the important affective filters which relates to success and/or failure in learning. Test anxiety can cause a variety of behaviours and prominent among them are students rushing through tests in order to escape the unpleasant experience, refusing to complete any part of the test and quitting after completing only a few problems (Casbarro, 2005). This means that test anxiety, if not noticed and addressed adequately, will have negative effects on the performance of test takers thereby making the issue of test anxiety very critical.

II. CONCEPTS OF TEST AND TEST ANXIETY

Amedahe and Asamoah-Gyimah (2016) explain a test as series of tasks which are used to measure specific traits or attributes of interest. Anxiety therefore, is a feeling of apprehension, uncertainty, or tension stemming from the anticipation of an imagined or unreal threat, sometimes manifested by tachycardia, palpitation, sweating, disturbed breathing, trembling, or even paralysis (Cassady, 2004). For the purpose of this study, test anxiety is defined as an emotional state that has psychological and behavioural concomitants and that is experienced in formal testing or other evaluative situations. According to Ali and Moshin (2013), numerous students have to

face different situations of anxiety during examination and thus, anxiety has adverse and negative effects in the process of examination. Making inferences from the position of Ali and Moshin (2013), it might not be necessary to say that students who get lower achievement in examinations are less intelligent because it might be the result of test anxiety.

As part of educational accountability and the frequency of standardised testing, Putwain (2008) notes that there has been an increased prevalence of anxiety among students. Test anxiety can affect any student irrespective of origin and academic prowess which consequently affect students' performance on standardised tests. It is in this regard that Cassady (2004) identifies test anxiety as a two-factor construct, consisting of the cognitive (often referred to as worry) and emotional (or affective) components. The predominant view of the relationship between these two factors is that the cognitive component directly impacts performance while the emotionality component is related but does not directly influence test performance (Cassady, 2004). Studies have shown that high cognitive test anxieties in students generally lead to lower test scores and a higher feeling of helplessness (Cassady, 2004; Chavous, 2008; Markman, Balik, Braunstein-Bercovitz&Ehrenfeld, 2010; Ali &Moshin, 2013). Not only does test anxiety lead to lower test scores, Chavous (2008) explains that it has an impact on students' ability to learn and perform well in test situations. Test anxiety is critical because, it affects one's ability to perform effectively on test situations, deters him/her to prepare for the test and study the prepared materials (Chavous, 2008).

According to Chavous (2008), test anxiety has increased in the 21st century because of the increased emphasis on testing in schools thereby making it a staple in students' poor test grades and poor preparation techniques. From the aforementioned literature, it is obvious that test anxiety has a negative influence on students' test taking processes as well as their performance. To validate such stances further, Kassim, Hanafi and Hancock (2008) found that test anxiety is negatively related to academic performance. Similarly, several studies such as the works of Rafiq, Ghazal and Farooqi (2007) and Markman et al. (2010) found that test anxiety is negatively related to academic performance. With reference to these unpleasant findings regarding text anxiety, there is the need to develop an instrument especially in the case of Ghana to measure such psychological and behavioural construct. The case of Ghana is quintessential because efforts have been made in the western world to develop and validate sample instruments for measuring test anxiety among students (Von Der Embse, Barterian&Segool, 2013; Annika, Belkin, Verdelli, 2014; Wren & Benson, 2004). However, with respect to Ghana and West Africa in general, no attempts have been made to specifically develop and validate a standardised instrument for that purpose, hence the cultural habituation from the Ghanaian and the West African perspectives might be lacking regarding the aforementioned attempts. In order to address this research gap, the study sought to develop and validate an instrument to measure students' test anxiety in Ghana.

III. METHODS

Respondents

The respondents for the study were 367 (169 females and 198 males) third year senior high school students in the Cape Coast Metropolis of the Central Region of Ghana. From a total of 10 schools with a third year students' population of 7,909, multi-stage sampling procedures were used to select the 367 third year students. The decision of selecting 367 respondents was based on a recommendation by Krejcie and Morgan (1970) who indicated that a sample of 367 is representative enough for a population of 8000. Since an increment in sample size results to the likelihood of arriving at better results, the study used 367 although the population that was used in the study was not up to 8000. The basis for using the final year students stems from the fact that they were preparing to write their final external examinations which served as a good indicator to collect data on the study variables. The senior high school students from the Cape Coast Metropolis were also used because they mirror the rest of students in the senior high schools in Ghana and that what happens within the schools in the Cape Coast Metropolis is the true reflection of the schools' situations in the other metropolis in Ghana.

Instrument development process

Before the construction of the instrument, both the theoretical and empirical domains of the construct were identified. For specificity, the theoretical domain was formulated from research literature. Based on test anxiety literature, the researcher viewed test anxiety in students to be a situation-specific trait which is manifested during formal evaluative situations and is experienced as an unpleasant emotional state. After a thorough assessment and review of literature, the construction phase was executed which involved the creation of the initial pool of items, review of the items, preliminary item try-outs, and final editing of items. The Likert method of ratings was chosen as the item response format with four response options namely; 1 = almost never, 2 = some of the time, 3 = most of the time and 4 = almost always, with 1 indicating the lowest agreement to the items and 4 indicating the highest agreement to the items. The pool of items was constructed based upon the content analysis in literature during the planning phase. More than 30 items were initially crafted to make room for unsatisfactory ones to be replaced before finalising on the 30 items. The 30 items were pilot-tested on a relatively low sample (10 respondents) and a reliability value of 0.802 was attained. Notably, majority of the items were written in first person singular. In addition, the breadth of the items were clearly limited for

specificity of response. The 30 developed items before the factor analysis and validation are shown in Appendix B.

Factor Analysis Process

The Exploratory Factor Analysis using the Principal Component Analysis with Varimax (orthogonal) rotation was performed on the thirty (30) items that relate to measuring test anxiety among students. Using Eigen values greater than 1, the Exploratory Factor Analysis retained only two (2) factors (Test Anxiety Main- TAM and TestAnxiety Alternative- TAA) with items on the first (TAM) contributing to 60.02% of the variability in the entire set of variables. In examining the strength of the correlations among the items, the Kaiser Meyer Olkin (KMO) and the Bartlett's test of sphericity were used. In particular, the KMO measure of sampling adequacy was 0.924. In addition, the Bartlett's test of sphericity was also significant ($\chi^2 = 4267.666$, $p = 0.000$) and this explains that the Exploratory Factor Analysis could be performed on the selected sample. As part of the analysis procedures, the communalities of all the thirty (30) developed items had a least value of 0.445 and a highest value of 0.708. The values of the communalities confirm that each of the items share common variances. Yong and Pearce (2013) note that in the conduct of factor analysis, all items with a rotated factor loadings and correlations below 0.32 must be rejected. In line with the position of Young and Pearce (2013) and for meaningful attainment of items, the cut-off point was increased to 0.40 and this means that all the rotated factors with factor loadings below 0.40 were rejected. The two scales, TAM and TAA were then retained. After the analysis, it was observed that the item loads on TAA were less than 0.40 which is the cut-point. In this regard, they were not included any further. Again, all item loadings on the main factor TAM, which had a rotated factor loading below the cut-off point were rejected. The final items that loaded on the main factor (TAM) with their factor loadings are presented in Table 1.

Table 1: Factor Loadings of Items

Items	Factor 1
I have more difficulty than the average student when taking a test	.504
I will worry that I might forget the materials I have read on the day of test	.508
I worry about how my grade will be	.553
On the whole, I think every test I take is difficult	.812
There is a fear in me when taking a test	.468
I am emotionally unstable a day before the test	.805
I think that I should have studied harder	.673
I feel nervous when taking a test	.783
I check the time constantly when taking a test	.591
I find very difficult to sit still	.679
On the whole my heart beats fast	.547
I have to go to the washroom severally	.586
I find it to concentrate when the test gets closer	.715
I cannot sleep without worrying about the test	.737
I even wonder if I will pass the test	.683
I think other students will do better than me	.534
I am confident before, during and after taking a test	.487
I think I am going to get an unsatisfactory score	.692
I make careless mistakes when taking a test	.645
During the test, I feel I studied the wrong things	.591

Extraction Method: Principal Component Analysis
 Rotation: Varimax with Kaiser Normalisation
 Source: Field data (2019)

It is evident in Table 1 that out of the 30 initial items (refer to Appendix B) that were developed to measure students' test anxiety, 20 items loaded onto the main factor TAM with a lowest rotated factor loading of 0.468 and the highest rotated loading of 0.812.

Reliability of the final items

In assessing the reliability and in particular the internal consistency of the final twenty (20) items in measuring students' text anxiety, the Cronbach's Alpha reliability estimate was used. This was of the view that the items were measured on a four point scale (1 = almost never, 2 = some of the time, 3 = most of the time and 4 = almost always). Although reliability ranges from 0.0 to 1.0, Pallant (2010) points that a high reliability must have a reliability coefficient greater than 0.7. The summary of the reliability analysis of the final twenty (20) items is presented in Table 2.

Table 2: Reliability Analysis of Final Items

Cronbach's Alpha	Number of items
0.894	20

Source: Field data (2019)

The result in Table 2 shows that there is a high level of internal consistency among the items. This is evident in the value of the Cronbach's Alpha (0.894) as indicated in Table 2.

IV. SUMMARY AND CONCLUSION

The aim of the study was to develop and validate an instrument for measuring text anxiety. What warranted this development stems from the fact that, with reference to the literature on the development and validation of test anxiety instrument especially in the case of Ghana and West Africa, it appears that no attempt has been made. From a sample of 367 respondents which included 169 females and 198 males, an Exploratory Factor Analysis was performed on initial 30 items that relate to measuring students' text anxiety. The analysis retained two factors namely TAM (Test Anxiety Main) and TAA (Text Anxiety Alternative). However, TAA was not captured in the analysis because the loads of all the items were less than 0.40 (which was the cut-point). After the analysis, 20 items were finally found to better measure students' test anxiety. The Cronbach's Alpha reliability estimate was conducted on the final 20 items and a reliability value of 0.894 was obtained. Based on the results as indicated above, the instrument, TAM (Text Anxiety Main), attached to this study at Appendix A, will be a good tool for researchers, counsellors, teachers, and interested individuals to determine or measure the level of test anxiety among students.

The instrument is scored from 1 to 4. The total highest score one can obtain is 80 whereas the total lowest score one can obtain is 20. Notably, the higher the score, the higher the level of anxiety and the vice versa. Preferably, scores below 40 indicate low level of test anxiety.

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APPENDIX A
TEST ANXIETY MAIN (TAM) - INSTRUMENT

Instruction

The items in the instrument refer to experiences that may cause fear or apprehension before, during and after taking a test. For each of the items, kindly write in the box the corresponding number of rating. Try as much as possible to be frank in the responses you give and treat each item independently.

Ratings:

1 = Almost Never 2 = Some of the Time

3 = Most of the Time 4 = Almost Always

<i>Items</i>	<i>Almost Never</i>	<i>Some of the Time</i>	<i>Most of the Time</i>	<i>Almost Always</i>
1. I have more difficulty than the average student when taking a test				
2. After a test, I worry about whether I did well enough				
3. I worry that I might forget the materials I have read on the day of test				
4. I worry about what my grade will be				
5. On a whole, I think every test I take is difficult				
6. There is a fear in me when taking a test				
7. I am emotionally unstable a day before the test				
8. I think that I should have studied harder				
9. I feel nervous when taking a test				
10. I check the time constantly when taking a test				
11. I find it very difficult to sit still				
12. On the whole, my heart beats fast				
13. I have to go to the washroom severally				
14. I find it difficult to concentrate when the test gets closer				
15. I even wonder if I will pass the test				
16. I think other students will do better than me				
17. On a whole, I am confident before, during and after taking a test				
18. I think I am going to get unsatisfactory score				
19. I make careless mistakes when taking a test				
20. During the test, I feel I studied the wrong things				

APPENDIX B
INITIAL DEVELOPED ITEMS BEFORE EFA

1 = Almost Never *2 = Some of the Time*
3 = Most of the Time *4 = Almost Always*

<i>Items</i>	<i>Almost Never</i>	<i>Some of the Time</i>	<i>Most of the Time</i>	<i>Almost Always</i>
1. I have less difficulty than the average student when taking a test				
2. I think about the consequences of my failure				
3. I worry about what my parents and peers will say				
4. After a test, I worry about whether I did well enough				
5. I worry that I might forget the materials I have read on the day of test				
6. I worry about what my grade will be				
7. I am calm than the average student when taking a test				
8. On a whole, I think every test I take is difficult				
9. There is a fear in me when taking a test				
10. I am emotionally unstable a day before the test				
11. I think that I should have studied harder				
12. I feel nervous when taking a test				
13. I check the time constantly when taking a test				
14. I find it very difficult to sit still				
15. On the whole, my heart beats fast				
16. My hand shakes when taking a test				
17. I have to go to the washroom severally				
18. I finally recall the answers after a test				
19. I find it difficult to concentrate when the test gets closer				
20. On the whole, I feel uncomfortable when taking a test				
21. I cannot sleep over worrying about test				
22. I even wonder if I will pass the test				
23. I think other students will do better than me				
24. On a whole, I am confident before, during and after taking a test				
25. I think I am going to get unsatisfactory score				
26. I do well in speed test in which there are time limits				
27. I make careless mistakes when taking a test				
28. I do not panic when I see unexpected questions				
29. During the test, I feel I studied the wrong things				
30. I think that majority of my answers were wrong				