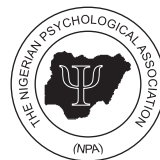


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TABLE OF CONTENTS

Factor Structure, Reliability and Validity of Two Statistical Anxiety Measures in a Sample of Nigerian Psychology Undergraduates - <i>Igbokwe, D. O., Oyewole, F. O., Prekake, T. S., Agoha, B. C. E. & Agbu, Jane-Frances</i>	663 - 681
Micro-Expression Identification Skills and Deception Detection among Airport Security Personnel - <i>Peter O. Olapegba & Oluwafemi Famakinde</i>	682 –693
Childhood Sexual Abuse and Depressive Symptoms among Adolescents: The Buffering Role of Resilience - <i>Chika R. Ezeugwu & Prisca O. Obierefu</i>	694 – 703
Alternative Dispute Resolution for the Promotion of Peace and Development in Nigerian Urban Communities - <i>John Ehiabhi Anegbode & Sylvester Alonge</i>	704 – 714
Parenting Intervention to Reduce Child Negative Discipline in Nigeria: A Pep Evaluation Study - <i>Dorothy Ofoha & Rotimi Ogidan</i>	715 – 733
Relational Conflict Resolution Strategies Predicting Occupational Burnout and Psychological Well-being of Military Medical Personnel in Lagos, Nigeria - <i>Bolanle Ogunbamila & Sunday J. Ogunleke</i>	734 – 757
Suicidal Ideation in Nigerian Adolescents: The Roles of Rumination and Academic Hardiness - <i>Adepeju Ogunbamila & Janet Tolulope Olaseni</i>	758 – 768
Positive and Negative Religious Coping Strategies among Traumatized Military Combatants in Jos, Nigeria - <i>Dachalson, E. M., Gyang, E. D., Evans, B., Simon, J. B., Bankat, M. A. & Azi, P. S.</i>	769 – 784
Prosocial Behaviour among Nigerian Police Sample: Roles of Sociability, Interpersonal Relationship and Assertiveness Skill - <i>Olukayode A. Afolabi</i>	785 – 798

FACTOR STRUCTURE, RELIABILITY AND VALIDITY OF TWO STATISTICAL ANXIETY MEASURES IN A SAMPLE OF NIGERIAN PSYCHOLOGY UNDERGRADUATES

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ABSTRACT

The study seeks to establish the factor structure, the reliability and validity of Statistics Anxiety Rating Scale (STARS) and the Statistics Anxiety Scale (SAS). STARS and SAS were examined among a sample of Psychology students in four Nigerian Universities comprising 110 males and 150 females with their age ranging from 16 to 29 years ($M = 20.97$; $SD = 2.81$). Factorial validation of the scales is in consonance with studies by other authors in other countries. Good scorer reliability was observed for both the STARS and the SAS. The Dieting belief Scale (DBS) was used to establish the divergent validity with .09 and -.10 for STARS and SAS respectively. A comparison of score across the sub-scale of STARS showed that mean scores were highest for worth of statistics and interpretation anxiety and lowest on fear of statistics teacher. For SAS, highest mean score was obtained for examination anxiety and lower for interpretation anxiety. Cronbach's alpha statistics indicates relatively similar findings with those of initial findings of STARS and SAS ranging from .72 to .93.

Keywords: Factor structure, reliability, statistics anxiety, Nigerian, undergraduates.

INTRODUCTION

Statistics anxiety is the feeling of worry that arises when one is engaged in courses that have to do with statistics or personally performing a statistical analysis (Cruise, Cash & Bolton, 1985). Exposure to any type or category of

statistics brings about statistics anxiety (Cruise et al, 1985; Onwuegbuzie, DaRos & Ryan, 1997) among students who have difficulties with quantitative courses. However, when it has to do with taking statistical examinations or test, another construct, statistical test anxiety, captures the experience (Benson, 1989; Onwuegbuzie &

Seaman, 1995; Zeider, 1991). Statistical test anxiety according to Benson (1989, p.247) is “the degree of test anxiety felt when taking an examination in a statistics course.” This construct is one of the domains or aspects of statistical anxiety measured by the Statistical Anxiety Rating Scale developed by Cruise and Wilkins (1980).

Statistical anxiety has been reported by many students (Onwuegbuzie & Wilson, 2003) and has been found to be prevalent among undergraduate students of Psychology (Yunis, 2006). This could be as a result of the emphasis generally placed on the knowledge of quantitative courses in various university disciplines in the Social Sciences especially Psychology (Dykeman, 2011; Onwuegbuzie & Wilson, 2003). Apart from Psychology students, statistical anxiety has been found to also manifest in Education, Sociology students (Dykeman, 2011; Birenbaum & Eylath, 1994; Murtonen & Lehtinen, 2003) and Social Sciences students in general (Zeidner, 1991). Statistical anxiety is more pronounced in students taking statistics courses compared with students taking other academic courses in the University (Dykeman, 2011).

Although statistics anxiety has been investigated and reported mainly among undergraduate students, scientific research has shown that it is also common among graduate students (Hsiao & Chiang, 2011; Onwuegbuzie, 1997, 1999; Onwuegbuzie & Wilson, 2003;

Perepiczka, Chandler & Becerra, 2011). In fact, it has been reported that about 80% of graduate students manifest statistical anxiety (Onwuegbuzie & Wilson, 2003). Among graduate students who manifest statistical anxiety, African American graduate students tend to manifest more statistical anxiety than Caucasian graduate students (Onwuegbuzie, 1999). Regardless of the fact that the relationship between age and statistical anxiety has not received vigorous research attention, it is worth mentioning that age has been found to affect the manifestation of statistics anxiety with older students manifesting statistics anxiety more than their younger counterparts (Baloglu, 2002; Baloglu, Deniz & Kesici, 2011).

There are conflicting results by different researchers with regard to gender differences in the manifestation of statistical anxiety. Some authors have reported that no major statistically significant gender difference exist in the manifestation of statistical, mathematics and test anxiety (Andile, 2009; Lacasse & Chiochio, 2005, Miji, 2009) as indicated by earlier studies (Bradley & Wygant, 1998; Volkmer & Feather, 1991; Onwuegbuzie, 1995). However, some authors have reported that females tend to manifest higher general and statistical test anxiety (Benson, 1989) than males. But this observed difference could be as a result of females' general lack of interest in mathematics (Lacasse & Chiochio, 2005). In a recent study, which is line with females manifesting higher statistical anxiety than males,

the authors (Balogluet *al*, 2011) found that females had higher scores than males on test/class anxiety and interpretation anxiety subscales of the Statistical Anxiety Rating Scale (STARS).

One of the major research instruments designed to measure statistical anxiety is the Statistical Anxiety Rating Scale (STARS) developed by Cruse and Wilkin (1980). Although there are various statistics anxiety scales like Statistics Anxiety Scale (Betz, 1978; Pretorius & Norman, 1992); Statistical Anxiety Scale (Vigil-Colet, Lorenzo-Seva & Condon, 2008); Attitude Towards Statistics Scale (Wise, 1985), Statistics Anxiety Inventory (Zeidner, 1991) and so forth, STARS has been noted to be more frequently used to measure and research this construct (Onwuegbuzie & Wilson, 2003). The STARS has been validated in various countries like Egypt (Yunis, 2006), South Africa (Mji & Onwuegbuzie, 2004), the United Kingdom (Hanna, Shevlin, & Dempster, 2008), the United States of America (Baloglu, 2003), Turkey (Baloglu, 2009) and more recently, China (Liu, Onwuegbuzie & Meng, 2011).

The manifestation of statistics anxiety can be reduced by different strategies and authors have outlined various modalities for achieving such (DeCesare, 2007; Onwuegbuzie, 2000; Onwuegbuzie & Wilson, 2003; Rodarte-Luna & Sherry, 2008; Schacht & Stewart, 1990, Wilson, 1998). For instance, Firmin (2008) outlined seven steps in remediating undergraduate statistical anxiety

namely: using practitioners or non-mathematicians to teach the course, using a more conceptual instead of formula-based approach, bridging the gap between theory and practice, making statistics more interesting and participatory, translating statistical problems into case studies, using tutorials and other additional learning tools, and finally, encouraging students to journal their experiences. It is believed that these steps if followed will, to a great extent, reduce statistical anxiety.

As in other aforementioned countries, statistics anxiety has been found to be prevalent among Psychology students in Africa. For instance, in Egypt, Yunis (2006) found that students have difficulties with statistics in five major areas in decreasing order *viz*: “the course content, the lecturer and the teaching assistant, the examinations, the student her/himself, and the remoteness of the material taught from reality”(p.3). It has been reported that early discovery of these difficulties during the semester could be the best strategy in charting a way towards alleviating such difficulties (Cherney & Cooney, 2005).

Although statistical anxiety as a concept has not received much research attention in Nigeria, it has been observed by the authors to be in existence. As early as 1986, Ozioko found the course, psychological statistics; to be number four on the list of courses psychology students had aversion for in the University of Nigeria Nsukka. This implies that Nigerian Psychology students have

been found to have an aversion for statistics. The anxiety with which students enter into statistics classes with perceivable apprehension has been observed by the authors during their classes with undergraduate Psychology students. The course introduction to statistics has also been observed by the first author to be a nightmare and an anxiety inducing course for many Psychology students in Nigeria but the extent or magnitude of the anxiety induced by this course has not been examined empirically as a result of unavailability of empirically validated research instruments to tap statistical anxiety in Nigeria.

In some schools in Nigeria, where Psychology is hosted, Psychology undergraduate students take compulsory statistics courses every academic session from year one to third year (Covenant University Academic Handbook, Undergraduate, 2014). Statutorily, the National Universities Commission Benchmark Minimum Academic Standards for undergraduate programmes in Nigerian Universities (NUC BMAS Social Sciences, 2007) requires Psychology students to pass a compulsory course in statistics in year one and year three and a course in research methods which is interspersed with statistics as part of their course requirement for graduation. Interestingly, to the knowledge of the authors there is presently no empirical study to establish the reliability and validity of any statistical anxiety measure using Psychology students in Nigeria. Hence, the objective of this study is to

establish the factor structure, the reliability and validity of the Statistics Anxiety Rating Scale (STARS) and the Statistics Anxiety Scale (SAS) with a sample of Nigerian Psychology undergraduates.

METHOD

In line with studies of this nature (Igbokwe, 2011; Igbokwe & Ola, 2011; Ola & Igbokwe, 2011; Igbokwe, Adeusi, Elegbeleye, & Agoha, 2016; Igbokwe *et al*, 2016), a cross-sectional survey research design was adopted for this study.

Participants

Two hundred and sixty students from four Nigerian Universities with Psychology discipline as a course at undergraduate level were randomly selected for this study. Two of the universities are privately owned, the third one is State Government owned and the fourth one is Federal Government owned. These universities are located in Lagos State and Ogun State. The age of the sample ranged between 16 and 29 years ($M = 20.97$; $SD = 2.81$). One hundred and ten of the participants were males while 150 were females. Forty two were First Year students, 82 Second Year students, 66 Third Year students, and 47 Fourth Year students. The two private universities made up 52.3% (136) of the participants, while 47.7% (124) of the participants were randomly selected from two government owned universities.

Measures

A questionnaire with two parts was used for data collection. The first part captured the demographic variables of the participants while the second part contained the STARS, SAS and Dieting Belief Scale (DBS) by Stotland and Zuroff (1990) for divergent validity.

STARS: The STARS was developed by Cruise and Wilkins (1980) and captures six dimensions of statistics anxiety with its six sub scales and 51 items (Cruise *et al*, 1985). According to Hsaio (2010), the STARS have two super ordinate factors with each factor containing three sub-scales. These super ordinate factors are: anxiety about statistics perception of/about statistics and attitude towards statistics. The first super ordinate factor has the following sub-scales: interpretation anxiety, test and class anxiety, and fear of asking for help while the second super ordinate factor has the following sub-scales: worth of statistics, computational self-concept and fear of statistics teachers (Hsiao, 2010). The components of these super ordinate factors had earlier been identified by Cruise *et al* (1985) as the six sub-scales that make up the STARS. Sample items include: studying for an examination in a statistics course, interpreting the meaning of a table in a journal article, going to ask my statistics teacher for individual help with material I am having difficulty understanding, I'm never going to use statistics so why should I have to take it?, I'm too slow in my thinking to get through statistics. The frequency of STARS'

use in studies attests to its validity and reliability as a robust measure of statistical anxiety (Onwuegbuzie & Wilson, 2003). Cruise *et al* (1985) found the STARS to be positively correlated with the Mathematics Anxiety Scale (MAS). The STARS measures anxiety in a progressive Likert format with 1 as "no anxiety" and 5 as "very much anxiety." The higher the overall score on the STARS, the higher the anxiety manifestation of the respondent. The STARS can also be scored based on the score of the respondent on each of the sub-scale.

SAS: The SAS was developed by Vigil-Colet, Lorenzo-Seva and Condon (2008) to bridge the gaps they observed lacking in the measurement of statistics anxiety with STARS. These gaps are based on the following: length of STARS, the fact that STARS does not specifically measure anxiety alone and the need for a scale that captures current realities in social sciences statistics (Vigil-Colet *et al*, 2008). The SAS is a 24 item scale with 12 items adapted from STARS and an additional 12 new items. The SAS has 3 sub-scales which are examination anxiety, asking for help anxiety and interpretation anxiety. Eight items make up each of the 3 sub-scales of the SAS. The SAS has an internal consistency of 0.91 and has a positive correlation with measures of trait anxiety and neuroticism. The SAS measures anxiety in a progressive Likert format with 1 as "no anxiety" and 5 as "very much anxiety." Sample Items include:

Going to statistics exam without having enough time to revise, asking a teacher for help when trying to interpret a result table, trying to understand the statistical analyses described in the abstract of a journal article, going to the teachers office to ask questions, asking a private teacher to tell me how to do an exercise. High scores on either the scale or sub-scales indicate high statistics anxiety. The SAS has been seen to have good validity and reliability among Italian participants (Chiesi, Primi & Carmona, 2011).

DBS: The Dieting Belief Scale is a 16 item scale developed by Stotland and Zuroff in 1990. It measures locus of control in relation to the belief of the person intending to lose weight. This means that it measures whether an individual will attribute his/her beliefs about losing weight to either being personally determined or being environmentally or externally determined. The items on the DBS are measured in a progressive Likert format with 1 measuring “not at all descriptive of my beliefs” and 6 measuring “very descriptive of my beliefs.” Sample Items include: By restricting what one eats, one can lose weight, when people gain weight, it is because of something they have done or not done, unsuccessful dieting is due to lack of effort, in order to lose weight, people must get a lot of encouragement from others. While some DBS items are scored directly, some are reverse scored. The DBS has good reliability and validity. Stotland and Zuroff (1990) obtained a test-

retest coefficient of .81, a Cronbach alpha’s coefficient of 0.68 and a convergent validity of 0.62 with Weight Locus of Control (WLOC) Scale (Saltzer, 1982) for the DBS. For this study, the DBS was validated using 102 participants and a test retest coefficient of .67 was obtained with a Cronbach alpha coefficient of .84 using a cross-section of Nigerian undergraduate students. The three factor model suggested by Stotland and Zuroff (1990) was also confirmed through factor analysis with the 3 factors explaining 53.93% of the variance (30.06%, 16.08% & 7.79% respectively).

Procedure

The students were administered the questionnaires in their class after permission was obtained from the school authorities and the students formally consented to being part of the research. They were told the purpose of the study and the questionnaire administered to them using simple random sampling, odd and even technique. The odd numbered students were administered the questionnaires, which were also collected immediately. To the knowledge of the present authors and as recently reported by Baloguet, *al* (2011), there exist no test-retest reliability information or result for the STARS. In order to bridge this gap in literature, test-retest reliability was added as one of reliabilities to be established in this study. To capture this, the participants were told that the research assistant will meet with them in two weeks for a re-administration

of the questionnaires (their matriculation numbers were used to identify them for the test- retest analysis). Ethics clearance was obtained from the Ethics Committee of the Covenant University Centre for Research Innovation and Discovery (CUCRID). Translation and back translation was not necessary because Nigeria has the English Language as

lingua franca, and students are taught in the English language at all levels of Education in Nigeria. The research data was analysed using the Statistical Package for Social Sciences version 19.0 (SPSS inc, 2010). Means, correlations and factor structures for the STARS and SAS were obtained from the data analysis.

RESULTS

Tables 1 shows mean, standard deviation and median differences in scores of the STARS

Table 1: Means, Medians, Standard Deviations, and Intercorrelations of the STARS

Scale	1	2	3	4	5	6
1. Worth of statistics	----					
2. Interpretation anxiety	.57**	----				
3. Test and class anxiety	.46**	.81**	----			
4. Computational self concept	.91**	.54**	.43**	----		
5. Fear of asking for help	.50**	.74**	.75**	.48**	----	
6. Fear of statistics teacher	.82**	.47**	.41**	.81**	.45**	----
Total Scale Score	.91**	.83**	.74**	.87**	.74**	.81**
M	46.96	32.36	23.30	20.62	10.85	14.57
SD	13.88	8.92	6.33	6.36	3.62	4.55
Median	48.00	33.50	24.00	21.00	11.00	15.00

A comparison of means across the sub scales shows that participants' mean score was highest for worth of statistics, interpretation anxiety, test and class anxiety, computational self-concept and fear of statistics teacher, in that order. The highest intercorrelations coefficients are between worth of statistics and computational self-concept (r=.91), worth of statistics and fear of statistics

teacher (r=.82), and fear of statistics teacher and computational self-concept (r=.81). There were also very high intercorrelations between fear of asking for help and test and class anxiety (r=.75), and also between fear of asking for help and interpretation anxiety (r=.74). Table 2 shows the means, medians, standard deviations, and intercorrelations of the SAS.

Table 2: Means, Medians, Standard Deviations and Intercorrelations of the SAS

Scale	1	2	3
1. Examination anxiety	----		
2. Asking for help	.65**	----	
3. Interpretation anxiety	.64**	.83**	----
Total Scale Score	.85**	.93**	.92**
M	24.57	22.58	23.35
SD	6.96	7.49	7.23
Median	24.00	23.00	24.00

Result shows that the highest mean score was on the Examination anxiety and interpretation domains, although the means are nearly equivalent. Asking for help showed greater score variation ($SD=7.49$) compared to interpretation anxiety ($SD=7.23$) and Examination anxiety ($SD=6.97$). The median scores did not differ

considerably between the SAS components.

Score Reliability

Tables 3 and 4 shows the Cronbach's alpha internal consistency reliability coefficients for the subscales of both the STARS and the SAS with their confidence intervals.

Table 3: Cronbach's Alpha Value and Confidence Interval of the STARS

Scale	N	Alpha Value	95% CI
1. Worth of statistics	16	.93	.91-.93
2. Interpretation anxiety	11	.88	.85-.90
3. Test and class anxiety	8	.81	.77-.84
4. Computational self-concept	7	.84	.80-.86
5. Fear of asking for help	4	.72	.66-.77
6. Fear of statistics teacher	5	.78	.73-.82
Total Scale Score	51	.96	.95-.97

A high confidence interval of the total scale score ($Alpha=.96$) and worth of statistics ($Alpha=.93$) subscale was obtained for the STARS in Table 3.

The Alpha coefficients of all the other subscales were greater than 70 and thus, have good acceptability (Liu *et al.*, 2011; Kline, 1999). For a tabular

comparison of the Cronbach Alpha (1985) and Onwuegbuzie (1993), see values and confidence intervals of Liu *et al* (2011, p. 35). Baloglu (2003, 2002), Cruise *et al*

Table 4: Cronbach's Alpha value and Confidence Interval of the SAS

Scale	N	Alpha value	95%CI
1. Examination anxiety	8	.81	.78-.85
2. Asking for help	8	.81	.77-.84
3. Interpretation anxiety	8	.81	.77-.84
Total Scale Score	24	.91	.92-.94

Table 4 displays the alpha coefficients of the subscales of the SAS. The coefficients of the three subscales fall within the acceptable range as in the case of the STARS. Cronbach's alpha of .81 was obtained for Examination anxiety as it was for test and class

anxiety in the STARS. Interpretation anxiety compared very closely between the SAS (alpha =.81) and the STARS (alpha=.88). The overall scale score also yielded a very high alpha coefficient of 0.91.

Table 5: Comparison of Cronbach's Alpha Value and Confidence Interval of the STARS

Scale	Present Study	Liu <i>et al</i> (2011)
1. Worth of statistics	.93 (.91-.93)	.91 (.89-.93)
2. Interpretation anxiety	.88 (.85-.90)	.86 (.83-.89)
3. Test and class anxiety	.81 (.77-.84)	.85 (.82-.88)
4. Computational self-concept	.84 (.80-.86)	.74 (.68-.79)
5. Fear of asking for help	.72 (.66-.77)	.72 (.65-.78)
6. Fear of statistics teacher	.78 (.73-.82)	.69 (.62-.75)
Total Scale Score	.96 (.95-.97)	.94 (.93-.95)

Table 5 is a comparison of the Cronbach alpha coefficients of the STARS obtained from the present study and that of Liu *et al* (2011). Both results are quite similar in most of the subscales and the total scale scores, the exception being computational self-concept with a difference of Alpha=.10, and fear of

statistics teacher, Alpha=.09. All other differences were in the negligible range of alpha=.02. For a tabular comparison of the Cronbach Alpha values and confidence intervals of Baloglu (2003, 2002), Cruise *et al* (1985) and Onwuegbuzie 1993), see Liu *et al* (2011, p. 35).

Table 6: Convergent and Divergent reliabilities of STARS and SAS

Scale	Correlation
1. STARS Test - Retest	.56**
2. SAS Test - Retest	.53**
3. STARS & SAS	.80**
4. STARS and DBS	.09
5. SAS & DBS	-.10

The indices of test-retest reliability and of the convergent and divergent validity are shown on table 6. A two-week test-retest reliability coefficients of .56 and .53 were obtained for both the STARS and SAS respectively. A

convergent validity of .80 was found between both measures of statistics anxiety, and divergent validity coefficients of .09 and -.10 were obtained between the DBS and the STARS and SAS respectively.

Table 7: Factor Loadings and Communalities on the STARS

Item	F1	F2	F3	F4	F5	F6	h2
8	.720						.558
2	.645						.613
10	.631			.310			.511
3	.630						.550
11	.612	.307					.491
7	.609						.443
1	.607					-.394	.671
4	.604						.492
13	.602						.496
15	.587						.475
5	.567						.436
14	.543						.490
6	.543						.462
12	.535	.351				.324	.529
9	.493						.415
31		.748					.629
30		.703					.634
33	.641	.330					.594
29		.633					.547
32		.618					.506
34		.605	.307				.576
35		.578					.509
38		.572	.327	.317			.565
27		.571	.389				.580
25		.557			.403		.584
26		.523	.338		.352		.612
37		.508	.348	.356			.552
28		.466	.444				.524
36		.454	.319	.306		.452	
40			.714				.587
41			.704				.645
51			.692				.629
42		.333	.660				.612
50			.623	.333			.607
39		.380	.620				.576
49			.567	.356			.595

19						.681	.570
21						.664	.595
20	.306					.648	.575
22					.623		.528
23						.585	.524
24		.513				.560	.672
46					.722		.659
44					.638		.595
45			.352		.633		.616
47					.600		.584
48			.396	.538			.557
43			.445		.453		.514
17	.350					.573	.583
18	.331				.355	.554	.591
16	.428				.307	.470	.531
% of variance	33.65	9.41	3.67		3.23	2.99	2.82

Table 8: Factor Loadings and Communalities on the SAS

Item	F1	F2	F3	h2
17		.783		.705
23		.766		.706
22		.763		.659
24		.755		.651
16		.741		.658
21	.730			.672
18		.654		.467
19		.469		.264
7		.348	.705	.618
8			.703	.587
6		.340	.659	.551
9		.609	.331	.500
2			.597	.465
5		.381	.593	.512
1		.587	.382	.502
10		.416	.586	.517
11			.555	.426
12	.376	.540	.313	.531
3		.524	.409	.503
13			.789	.691
15			.722	.583
20		.402	.591	.514
14		.408	.498	.466
4			.375	.204
% of Variance		39.96	8.16	5.49

An Exploratory Factor Analysis was conducted on the STARS and SAS which confirmed the six factor structure of the STARS (Cruise *et al.*, 1985) and three factor structure of the SAS (Vigil-Colet *et al.*, 2008) using Principal Component Analysis with Varimax Rotation. The Kaiser-Meyer-

Olin measure of sampling adequacy was .921 and Bartlett's Test of Sphericity was significant ($p < .000$) for STARS. For SAS, Kaiser-Meyer-Olin measure of sampling adequacy was .908 and Bartlett's Test of Sphericity was significant ($p < .000$). These show that the data was appropriate for

Exploratory Factor Analysis (EFA). With the suppression of small coefficients below .30, a six factor model for the STARS was obtained (Table 7) with 15, 14, 7, 6, 6, and 3 items, loading on factors 1, 2, 3, 4, 5, and 6 respectively (Factor 1 = 8, 2, 10, 3, 11, 7, 1, 4, 13, 15, 5, 14, 6, 12, 9 = 15. Factor 2 = 31, 30, 33, 29, 32, 34, 35, 38, 27, 25, 26, 37, 28, 36 = 14. Factor 3 = 40, 41, 51, 42, 50, 39, 49 = 7. Factor 4 = 19, 21, 20, 22, 23, 24 = 6. Factor 5 = 46, 44, 45, 47, 48, 43 = 6, Factor 6 = 17, 18, 16 = 3). The present STARS factor loading per factor incidentally differs from the factor loadings recorded by Liu *et al* (2011) and the original factor loadings of the STARS by Cruise *et al* (1985) (Factor 1 = 24, 26, 27, 28, 29, 33, 35, 36, 37, 40, 41, 42, 45, 47, 49, 50 = 16. Factor 2 = 2, 5, 6, 7, 9, 11, 12, 14, 17, 18, 20. Factor 3 = 1, 4, 8, 10, 13, 15, 21, 22. Factor 4 = 25, 31, 34, 38, 39, 48, 51, Factor 5 = 3, 16, 19, 23, and Factor 6 = 30, 32, 43, 44, 46). For the three factor loadings obtained (Table 8) for the SAS, 8, 11, and 5 items each was obtained for factors 1, 2, and 3 respectively (Factor 1 = 17, 23, 22, 24, 16, 21, 18, 19 = 8. Factor 2 = 7, 8, 6, 9, 2, 5, 1, 10, 11, 12, 3 = 11. Factor 3 = 13, 15, 20, 14, 4 = 5). This differed from the loadings originally recorded by Vigil-Colet *et al* (2008) (Factor 1 = 1, 4, 9, 11, 13, 14, 15, 20. Factor 2 = 3, 5, 7, 12, 17, 21, 23, 24 and Factor 3 = 2, 6, 8, 10, 16, 18, 19, 22).

DISCUSSION

The study sought to establish factor structure, reliability and validity of two statistical anxiety scales,

STARS and SAS using Nigerian sample. A comparison of tables 3 and 4 indicates that alpha values are quite similar for both the STARS and SAS in similar subscales namely, interpretation anxiety, test and class anxiety, fear of asking for help (STARS), and examination anxiety, Asking for help, and Interpretation anxiety (SAS) accounted for the high convergent validity obtained between both scales.

The mean and median scores of Nigerian on the STARS were consistently higher than those of the Chinese students studied by Liu *et al*. (2011) across all domains. They also evinced higher scores in the *Asking for help* and *interpretation anxiety* subscales of the SAS than reported by Vigil-Colet *et al* (2008). Nigerian Psychology students nevertheless scored lower on the examination anxiety subscale. However, since the participants in the study were not equivalent, it is difficult to generalize the results from one population to the other. These high mean scores on all domains of statistics anxiety among Nigerian Psychology students have implications for teaching statistics. Statistics teachers in Nigeria need to examine their teaching methods and adopt a less authoritative method as suggested by Liu *et al*. (2011). Incidentally, less than 50% of secondary school students in Nigeria have been reported to pass mathematics from year 2000 to 2011 except in 2008 when 56.96% passed (Anaduaka&Okafor, 2013). Hence, the high mean scores generally recorded by Nigerian Psychology students in statistics anxiety could be a

carryover effect from their lack of interest in mathematics during their secondary education.

The test-retest reliability and internal consistency measures were good for both the STARS and SAS. Specifically, a convergent validity of .80 was found between statistics anxiety, and divergent validity coefficients of .90 and -.10 were obtained between DBS and the STARS and SAS respectively. These similar findings make both STARS and SAS suitable for assessing statistical anxiety among Nigerian students. This study has confirmed the validity of the STARS and SAS in Nigeria as in other countries like Austria (Macheret *et al.*, 2013), China (Liu *et al.*, 2011), Egypt (Yunis, 2006), Singapore and Australia (Chew & Dillion, 2014). South Africa (Mji & Onwuegbuzie, 2004), Spain (Vigil-Colet *et al.*, 2008), Turkey (Baloglu, 2009), United Kingdom (Hanna *et al.*, 2008), and United States of America (Baloglu, 2003).

CONCLUSION

The minimal data in Nigeria on the level of anxiety students experience in quantitative courses is one of major reasons why this study was undertaken so that the STARS and SAS could be validated for use in Nigeria. We set out to assess the validity and reliability of the STARS and SAS among psychology students in some Nigerian universities. Specific insight on the subscales indicates that STARS is measured within 6 domains namely, worth of statistics,

interpretation anxiety, test and class anxiety, computational self-concept, fear of asking for help and fear of statistics teacher. On the other hand, the 3 subscales of SAS include: examination anxiety, asking for help and interpretation anxiety. All these are universal variables that could be associated with statistical anxiety and thus quite suitable for Nigerian sample. However, further enquiries should explore gender differences in the manifestation of statistics anxiety and also attempt a correlation between statistics anxiety and actual performance on statistic courses. Also, state and trait anxiety could be examined vis-à-vis statistics anxiety among Nigerian Psychology students.

REFERENCES

- Anaduaka, U. S., & Okafor, C. F. (2013). Poor performance of Nigerian students in mathematics in senior Secondary certificate examination (SSCE): what is not working? *JORIND, 11* (2), 1-5.
- Andile, M. J. I. (2009). Differences in university students' attitudes and anxiety about statistics. *Psychological Reports, 104* (3), 737 – 744.
- Baloglu, M., & Zelhart, P.F. (2003). Statistical anxiety: A detailed review. *Psychology and Education, 40*, 27-37.
- Baloglu, M. (2002). Psychometric properties of the Statistical Anxiety Rating Scale. *Psychological Report, 90*, 315-325.
- Baloglu, M. (2003). Individual differences in statistics anxiety among college students.

- Personality and Individual Differences*, 34 (5), 855 – 865.
- Baloglu, M. (2009). Statistical Anxiety Rating Scale: Adaptation to Turkish, language validity, and preliminary psychometric properties. *A paper presented at the 18th Annual Meeting of Educational Sciences*, Izmir, Turkey.
- Baloglu, M., Deniz, M. E., & Kesici, S. (2011). A descriptive study of individual and cross-cultural differences in statistics anxiety. *Learning and Individual Differences*, 21, (4), 387– 391.
- Benson, J. (1989). Structural components of statistical test anxiety in adults: an exploratory model. *The Journal of Experimental Education*, 57 (3), 247 – 261.
- Betz, N. E. (1978). Prevalence, distribution, and correlates of math anxiety in college students. *Journal of Counseling Psychology*, 25, (5), 441 – 448.
- Birenbaum, M., & Eylath, S. (1994). Who is Afraid of statistics? Correlates of statistics anxiety among students of educational sciences. *Educational Research*, 36 (1), 93 – 98.
- Bradley, D. R., & Wygant, C. R. (1998). Male and female differences in anxiety about statistics are not reflected in performance. *Psychological Reports*, 82 (1), 245 – 246.
- Cherney, I. D., & Cooney, R. R. (2005). Predicting student performance in a statistics course using the mathematics and statistics perception scale (MPSP). *Transactions of the Nebraska Academy of Sciences* 30: x–x. Retrieved from: <http://www.icherney.com/Research/Publications/MPSP.pdf>
- Chew, P. K. H. & Dillon, D. B. (2014). Reliability and validity of the statistical anxiety scale among students in Singapore and Australia. *Journal of tropical psychology*, 4 (e7), 1-7. DOI: <http://dx.doi.org/10.1017/jtp.2014.7> Retrieved from: <http://journals.cambridge.org/action/displayAbstract?fromPage=online&aid=9412515>
- Chiesi, F., Primi, C., & Carmona, J. (2011). Measuring Statistics Anxiety. Cross-cultural validity of the Statistical Anxiety Scale (SAS). *Journal of psycho-educational assessment*, 29 (6), 559 – 569.
- Covenant University Academic Handbook, Undergraduate (2014). *College of Leadership Development Studies (CLDS): 2014 – 2017*. Ogun State, Nigeria: Covenant University Press.
- Cruise, R. J., & Wilkins, E. M. (1980). STARS: Statistical Anxiety Rating Scale. *Unpublished manuscript*, Andrews University, Berrien Springs, MI.
- Cruise, R.J., Cash, R.W. & Bolton, D.L. (1985, August). Development and validation of an instrument to measure statistical anxiety. Paper presented at the annual meeting of the Statistical Education Section. *Proceedings of the American Statistical Association*, Chicago, IL.
- DeCesare, M. (2007). Statistics Anxiety among Sociology Majors: A First Diagnosis and Some Treatment Options. *Teaching Sociology*, 35(4), 360-367

- Hanna, D., Shevlin, M. & Dempster, M. (2008). The structure of the statistics anxiety rating scale: A confirmatory factor analysis using UK psychology students. *Personality and Individual Differences*, 45, (1), 68–74
- Hsiao, T., & Chiang, S. (2011). Gender differences in statistics anxiety among graduate students learning English as a foreign language. *Social Behavior and Personality*, 39 (1), 41 – 42.
- Hsiao, T. Y. (2010). The statistical anxiety rating scale: further evidence for multidimensionality. *Psychological Reports*, 107 (3), 977 – 982.
- Igbokwe, D. O. (2011). Confirmatory Factor analysis on the Enugu Somatization Scale. *Ife Psychologia*. 19 (1): 195 – 225.
- Igbokwe, D. O. & Ola, B. A. (2011). Development and Factorial validation of the Brain Fog Propensity Scale. *Association of Southeast Asian Nations Journal of Psychiatry (ASEAN)*, 12(1): 1 - 13.
- Igbokwe, D. O., Adeusi, S. O., Elegbeleye, A., Agoha, B. C. E. (2016). Harmony-Disharmony Scale: development and initial factorial validation. *Covenant International Journal of Psychology*, 1 (1): 33-49.
- Igbokwe, D.O., Agbu, J. O., Adekeye, O. A., Adeusi, S.O., Obidiran, O. D., Yabilsu, S. J., Akindele, Z. A., Agoha, B.C.E., & Ndom, R. J. E., (2016). Revalidation of some measures of psychological wellbeing using a cross-section of Nigerian adults. *Nigerian Psychological Research*, 4, 572 – 593.
- Lacasse, C., & Chiochio, F. (2005). Anxiety towards statistics: Further developments and issues. 66th Annual convention of the Canadian Psychological Association. Montreal, Quebec, Canada, June 9 – 11, 2005. Retrieved from: http://www.mapageweb.umontreal.ca/chiocchf/pub/999046_lacasse_chiocchio_handout.pdf
- Liu, S., Onwuegbuzie, A. J. & Meng, L. (2011). Examination of the score reliability and validity of the statistical anxiety rating scale in a Chinese population: comparisons of statistics anxiety between Chinese college students and their western counterparts. *Journal of Educational Enquiry*, 11 (1), 29 – 42.
- Macher, D., Paechter, M., Papousek, I., Ruggeri, K., Freudenthaler, H. H. & Arendasy, M. (2013). Statistics anxiety, state anxiety during an examination, and academic achievement. *British Journal of Educational Psychology*, 83 (4), 535 – 549.
- Miji, A. (2009). Differences in university students' attitudes and anxiety about statistics. *Psychological Reports*. 104 (3), 737 – 744.
- Murtonen, M. & Lehtinen, E. (2003). Difficulties experienced by education and sociology students in quantitative methods courses. *Studies in Higher Education*, 28 (2), 171 – 185.
- National Universities Commission (NUC BMAS Social Sciences, 2007). *Benchmark Minimum Academic Standards for undergraduate programmes in Nigerian Universities: Social Sciences*. Abuja, Nigeria: NUC.

- Ola, B. A. & Igbokwe, D. O. (2011). Factorial validation and reliability analysis of the Brain Fog Syndrome Scale. *African Health Sciences*, 11 (2): 334 – 339.
- Onwuegbuzie, A. J. & Seaman, M. A. (1995). The effect of time constraints and statistical test anxiety on test performance. *Journal of Experimental Education*, 63 (2), 115 – 124.
- Onwuegbuzie, A. J. & Wilson, V. A. (2003). Statistics anxiety: Nature, etiology, antecedents, effects, and treatments – a comprehensive review of the literature. *Teaching in Higher Education*, 8 (3), 159 – 209.
- Onwuegbuzie, A. J. (1995). Statistics test anxiety and female students. *Psychology of Women Quarterly*, 19 (3), 413 – 418.
- Onwuegbuzie, A. J. (1997). Writing a research proposal: The role of library anxiety, statistics anxiety, and composition anxiety. *Library & Information Science Research*, 19 (1), 5 – 33.
- Onwuegbuzie, A. J. (1999). Statistics anxiety among African American graduate students: An effective filter? *Journal of Black Psychology*, 25 (2), 189 – 209.
- Onwuegbuzie, A. J. (2000). I'll Begin My Statistics Assignment Tomorrow: The Relationship between Statistics Anxiety and Academic Procrastination. *Paper presented at the Annual Meeting of the American Educational Research Association* (New Orleans, LA, April 24- 28, 2000). Retrieved from: <http://www.eric.ed.gov/PDFS/ED442872.pdf>
- Onwuegbuzie, A. J., DaRos, D. & Ryan, J. M. (1997). The components of statistics anxiety: A phenomenological study. *Focus on Learning Problems in Mathematics*, 19 (4), 11 – 35.
- Onwuegbuzie, A.J. (1993). The interaction of statistics test anxiety and examination condition in statistics achievement of post-baccalaureate non-statistics majors. *Unpublished doctoral dissertation*, University of South Carolina.
- Ozioko, J. O. C. (1986). A survey of Nigerian undergraduates' preferences and aversions in psychology. *Nigerian Journal of Psychology*, 5 (1), 72 – 74.
- Perepiczka, M., Chandler, N. & Becerra, M. (2011). Relationship Between Graduate Students' Statistics Self-Efficacy, Statistics Anxiety, Attitude Toward Statistics, and Social Support. *The Professional Counselor: Research and Practice*, 1 (2), 99 – 108.
- Pretorius, T. B. & Norman, A. M. (1992). Psychometric data on the statistics anxiety scale for a sample of South African students. *Educational and Psychological Measurement*, 52 (4), 933 – 937
- Rodarte-Luna, B. & Sherry, A. (2008). Sex differences in the relation between statistics anxiety and cognitive / learning strategies. *Contemporary Educational Psychology*, 33 (2), 327– 344
- Saltzer, E. B. (1982). The Weight Locus of Control (WLOC) Scale: A specific measure for obesity research. *Journal of Personality Assessment*, 46 (6), 620 – 628.

- Dykeman, B. F. (2011). Statistics anxiety: Antecedents and instructional interventions. *Education, 132* (2), 441- 447.
- Firmin, M. (2008). Towards remediating undergraduate students statisticophobia. *College Teaching Methods and Styles Journal, 4* (4), 17 – 20.
- Schacht, S. & Stewart, B. J. (1990). What's funny about statistics? A technique for reducing student anxiety. *Teaching Sociology, 18* (1), 52 – 56.
- Stotland, S. & Zuroff, D.C. (1990). A new measure of weight locus of control: The Dieting Beliefs Scale. *Journal of Personality Assessment, 54* (1/2), 191-203.
- Vigil-Colet, A., Lorenzo-Seva, U., & Condon, L. (2008). Development and validation of the statistical anxiety scale. *Psicotherma, 2* (1), 174 – 180
- Volkmer, R. E., & Feather, N. T. (1991). Relations between type A scores, internal locus of control and test anxiety. *Personality and Individual Differences, 12* (2), 205 – 209.
- Wilson, V. A. (1998). A study of reduction of anxiety in graduate students in an introductory statistics course. Paper presented at the annual meeting of the Mid-South educational research Association (New Orleans, LA, November, 4-6) Retrieved from: <http://www.eric.ed.gov/PDFS/ED427075.pdf>
- Wise, S. L. (1985). The development and validation of a scale measuring attitudes toward statistics. *Educational and Psychological Measurement, 45*(2), 401-405.
- Yunis, F. A. (2006). Factors influencing psychology students in dealing with statistics courses. Paper presented at the seventh International Conference on Teaching Statistics (ICOTS7, Salvador, Bahais, Brazil 2 – 7- July, 2006). Retried from: http://www.stat.auckland.ac.nz/~ias/e/publications/17/9B3_YUNI.pdf
- Zeidner, M. (1991). Statistics and mathematics anxiety in social sciences students: Some interesting parallels. *British Journal of Educational Psychology, 61* (3), 319 – 328.