

Psychometric Properties of Spence Children's Anxiety Scale in Nigerian Primary Schools: Implication for Community Development

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Abstract

This study sought the psychometric properties of Spence children's anxiety scale in Nigerian primary schools in terms of exploratory and confirmatory factor analysis. A sample of 252 pupils randomly sampled in primary schools in Enugu state Nigeria was used for the study. Spence children's anxiety scale (SCAS) was adopted and validated. Principal component analysis with varimax rotation was used for the determination of the factors of the SCAS. After that, the extracted factors were subjected to confirmatory factor analysis to determine the model fit for the data using International Business Machines, Statistical Package for Social Sciences, Analysis of a Moment Structures (IBM SPSS AMOS). The analysis showed that the items of the subscales of SCAS had good internal consistency reliability indices with an overall reliability index of 0.890 and an estimate of the temporal stability of 0.943. The data also had a good model fit with confirmatory factor index (CFI) of 0.980 and root mean square error of approximation (RMSEA) of 0.039. SCAS is a reliable instrument that can be used to identify signs of academic anxiety among children in schools. This finding implicates community development of the children in the sense that when the children's experience of anxiety are properly handled using the SCAS, they will better contribute to the development of their communities when they come of age.

Keywords: Community development, Psychometric properties, Spence children's anxiety scale, Nigerian primary schools

I. Introduction

Most pupils in the Nigerian context go in for their examinations or tests with a high level of tension which results in the exhibition of test anxiety. Test anxiety, according to Segool, et al. as cited in Abbo et al. (2013) is the emotional responses associated with the potential consequences of negative evaluation test or examination situation. According to Nwokolo, Mokwelu and Eneasator (2016), test anxiety is mainly manifested

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in a school setting and most of the cases are noticed early. Test anxiety constitutes a serious academic impediment to lots of students in schools (Nwokolo, Mokwelu&Eneasator2016). Anxiety according to Direktör and Serin (2017) is a vital feeling experienced throughout life development as a protective and adaptive function. According to Karakayaand Oztop (2013), disorders as a result of anxiety have a pattern that negatively affects a person's life. Researching for the prevalence of anxiety in Turkey, Abbo et al. (2013)found that the patients found to be at risk stand at 26.6%; those who had specific phobia stand at 15.8%, those who had post-traumatic stress disorder stand at 6.6%, and those who had separation anxiety symptoms stand at 5.6%.

Early research showed that more than 33% school children and adolescents had test anxiety problems(Whitaker, Lowe& Lee 2007).Prevalence of anxiety disorder in developing regions (e.g., Nigeria) notwithstanding, children who have anxiety disorder are rarely identified and cared for(Chavira et al.2004; Sweeney, Rapee, Crozier & Alden 2005).Essau et al. (2011) opined that identifying clinically anxious children at an early stage is very important but its realization depends on the availability of reliable and valid screening tools. Spence children's anxiety scale [SCAS]) is one of such instruments that is less time consuming and less expensive to administer (Essau, Anastassiou-Hadjicharalambous&Mun~oz2011). Spence children's test anxiety scale (SCAS) has been validated by different researchers in different countries.

For instance, Spence (1997) reported the overall alpha for the SCAS to be .92, while the Cronbach alphas for the six subscales were .82 for panic-agoraphobic symptoms, .70 for separation anxiety, .70 for social phobia, .60 forphysical injury fears, .73 for obsessive-compulsive, and .73 for generalized anxiety. Similarly,Essau, Leung, Conradt, Cheng and Wong (2008), Essau, Sakano, Ishikawa and Sasagawa(2004), Ishikawa, Sato and Sasagawa (2009),Mellon and Moutavelis (2007), Whiteside and Brown (2008), Essau, Muris and Ederer (2002), Essau, Muris and Ederer (2002), Essau et al. (2011), Essau, Anastassiou-Hadjicharalambous andMun~oz (2011) found high alpha coefficients for the SCAS.

A confirmatory factor analysis using Australian children and adolescents showed that the six-factor had a higher-order model fit than the other models (four-factor and five-factor) (Spence 1997; Spence 1998). Buttressing these findings, Spence, Barrett and Turner (2003) and Essau, Anastassiou-Hadjicharalambous andMun~oz (2011) found a strong support for a six-correlated factor model which involved six factors. On the contrary, studies that used the various translated versions of the SCAS have not consistently supported the six-factor model. For example, a 5-factor model showed better model fit using German (Essau,Sakano, Ishikawa&Sasagawa2004), Chinese (Essau et al. 2008), and Japanese children (Ishikawa, Sato&Sasagawa2009). Also, the four-factor structure showed a better model fit using South Africanchildren (Muris, Schmidt, Engelbrecht & Perold 2002).

In a recent study using Turkish children, Direktör and Serin (2017) found that the six-factor SCAS has strong psychometric properties. The above preliminary review has shown that there are inconsistent findings concerning the validity and reliability of SCAS based on the number of factors. Besides, none of such studies has used Nigerian primary school children to validate any of the factors (4-factor, 5-factor or 6-factor) of SCAS. Thus, the researchers based on the established gaps in literature validated the SCAS in terms of EFA and CFA in Nigerian primary schools.

II. Methods

Participants

A sample of 252 primary school pupils in schools in Enugu State, Nigeria, was used for the study. The children were sampled through a multi-stage sampling procedure. At the first stage, 23 primary schools were randomly sampled for the population of primary schools in Enugu state. Secondly, a stratified random sampling technique was used to stratify the children based on primary 3 and 4. From each of the strata, a purposive sampling technique was used to select 252 children who had signs of depression. This sample is made of 120 (47.61%) male pupils and 132 (52.38%) female children. 40% (101) of the pupils are in primary 3 while 60% (151) of the pupils are in primary 4. 25% (63) of the pupils are within the age range of 5-6 years, 38% (96) of them are within the age range of 7-9 years while 37% (93) of them are above 9 years of age.

Measure

Spence Children's Anxiety Scale (SCAS)

The Spence Children's Anxiety Scale (SCAS; Spence, 1998) is a 38 item self-report scale. To indicate how often each of the items of SCAS happens, the children were asked to read and follow the instructions on the printed form on a 4-point scale: 'never', 'sometimes', 'often', or 'always'. The scale has 6-subscales: Social Phobia (SP-6 items), Panic and agoraphobia disorder (PAD- 9 items), Generalised Anxiety disorder (GAD-6 items), obsessive-compulsive disorder (OCD-6 items), Separation anxiety disorder (SAD-6 items), and specific phobias or Physical injury fear (PF/PIF -5 items). The responses are scored: Never = 0, Sometimes = 1, Often = 2 and Always = 3 which gives a maximum possible score of 114. Internal consistency reliability for the SCAS has been tested across a wide range of studies and consistently shows a very high internal reliability ($\alpha = .87-.94$). Internal reliability indices of the subscales range from satisfactory to high $\alpha = .48 - .81$.

Administration of the SCAS

Before the administration of the copies of SCAS, written permission from the headteachers of the schools was obtained by the researchers. After that, the copies of the SCAS were administered with the help of the primary school teachers in the schools visited. The children were given adequate time to fill out the items of SCAS. After two weeks of the administration of the first test, the same SCAS was re-administered to the same pupils to enable the researchers to determine the estimate of the temporal stability of the instrument. Finally, copies of the SCAS were retrieved from the children in each of the administrations and arranged for analysis.

Data Analysis

Data collected were analyzed using exploratory and confirmatory factor analysis using SPSS and IBM SPSS AMOS respectively. Principal component analysis with varimax rotation was used to carry out EFA while AMOS was used to carry out CFA. Cronbach alpha method and Pearson product-moment correlation were used to determine the internal consistency and temporal stability reliability indices of the SCAS. Confirmatory factor index (CFI), Chi-square goodness of fit test, and root mean square error of approximation (RMSEA) were used to test the model fit for the data. This analytical procedure has been used by Ugwuanyi and Okeke (2020), Ene et al. (2021), Ugwuanyi et al. (2021).

III. Results

Table 1

Kaiser-Meyer-Olkin (KMO) and Bartlett's Test for the Adequacy of the sample for the EFA of SCAS

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.	.768
Approx. Chi-Square	9301.400
Bartlett's Test of Sphericity Df	703
Sig.	.000

Table 1 shows that the KMO measure is 0.768 which shows that the sample size for the exploratory factor analysis of the SCAS was very adequate. From the same Table 1, Bartlett's test of sphericity is significant because its associated probability of 0.000 is less than 0.05. This means that the correlation matrix for the SCAS is not an identity matrix.

Table 2

Extraction and rotation sum of squares loadings that associated with the Factors

Component	Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	16.809	65.444	65.444	14.620	59.052	59.052
2	5.692	11.978	77.422	4.916	10.936	69.988
3	4.037	9.623	87.046	3.838	9.101	79.089
4	2.136	5.620	92.662	3.721	6.793	82.810
5	1.803	2.744	95.410	3.369	1.865	84.675
6	1.617	2.256	97.662	2.629	1.519	86.194

Table 2 shows that the eigenvalues associated with the rotated sums of square loadings of the six subscales of SCAS ranged from 2.629 to 14.620 with the highest eigenvalue explaining 59.052% from the total variance, while the lowest eigenvalue explained 1.519% from the total variance. The results further showed that the differences between extraction and rotation eigenvalues were small implying that the SCAS items loaded

strongly on the six factors at the extraction level. The iteration was rotated to have more item loadings as shown in Table 3.

Table 3

Rotated Component Matrix for the SCAS Items

	Subscales					
	PAD	SP	GAD	SP/PIF	OCD	SAD
Item5	.853					
Item8	.837					
Item4	.836					
Item7	.834					
Item9	.826					
Item3	.782					
Item1	.725					
Item28	.593					
Item31	.501					
Item27		.495				
Item20		.402				
Item30		.719				
Item22		.697				
Item6		.649				
Item24		.640				
Item26			.618			
Item29			.613			
Item14			.607			

Item38	.537		
Item36	.488		
Item32	.453		
Item12		.829	
Item10		.823	
Item15		.776	
Item11		.664	
Item13		.475	
Item23		.773	
Item25		.730	
Item21		.724	
Item17		.588	
Item19		.491	
Item35		.856	
Item37			.834
Item34			.544
Item33			.501
Item18			.770
Item2			.681
Item16			.437

Extraction Method: Principal Component Analysis.

Rotation Method: Varimax with Kaiser Normalization.

a. Rotation converged in 13 iterations.

Table 3 shows the exploratory factor analysis of SCAS in Nigerian primary school. The result revealed that six subscales of SCAS were factored using principal component analysis with varimax rotation. A cut of correlation coefficient of 0.40 was used as the criterion for the factor loadings for the items of SCAS. Out of the six subscales of SCAS, 9 items loading highly on factor 1 (PAD), 6 items loaded highly on factor 2 (SP), 6 items loaded highly on factor 3 (GAD), 5 items loaded on factor 4 (SP/PIF), 6 items loaded highly on factor 5 (OCD) while 6 items loaded highly on factor 6 (SAD). The factor loadings showed that the items correlated very highly among themselves for each of the subscales of the construct.

Table 4

Reliability of the Subscales of SCAS

Subscale	Cronbach Alpha (α)	Test-retest
Panic and agoraphobia disorder (PAD)	.765	.867
Social Phobia (SP)	.810	.910
Generalised anxiety disorder (GAD)	.804	.920
Specific phobias or Physical injury fear (SP/PIF)	.871	.899
Obsessive compulsive disorder (OCD)	.732	.870
Specific anxiety disorders (SAD)	.837	.911
SCAS	.890	.943

Table 4 shows that the subscales of SCAS demonstrated good internal consistency reliability indices ranging from 0.732 to 0.871. PAD had a reliability index of 0.765, SP had a reliability index of 0.810, GAD had a reliability index of 0.804, SP/PIF had a reliability index of 0.871, OCD had a reliability index of 0.731 and SAD had reliability index of 0.837. The overall reliability index of SCAS is 0.890. Table 4 also shows that the temporal stability indices of the SCAS range from 0.867 to 0.920 and the overall temporal stability index of 0.943. This indicates that SCAS demonstrated high stability in measuring the desired construct.

Table 5

Model Fit Indices for the SCAS Data

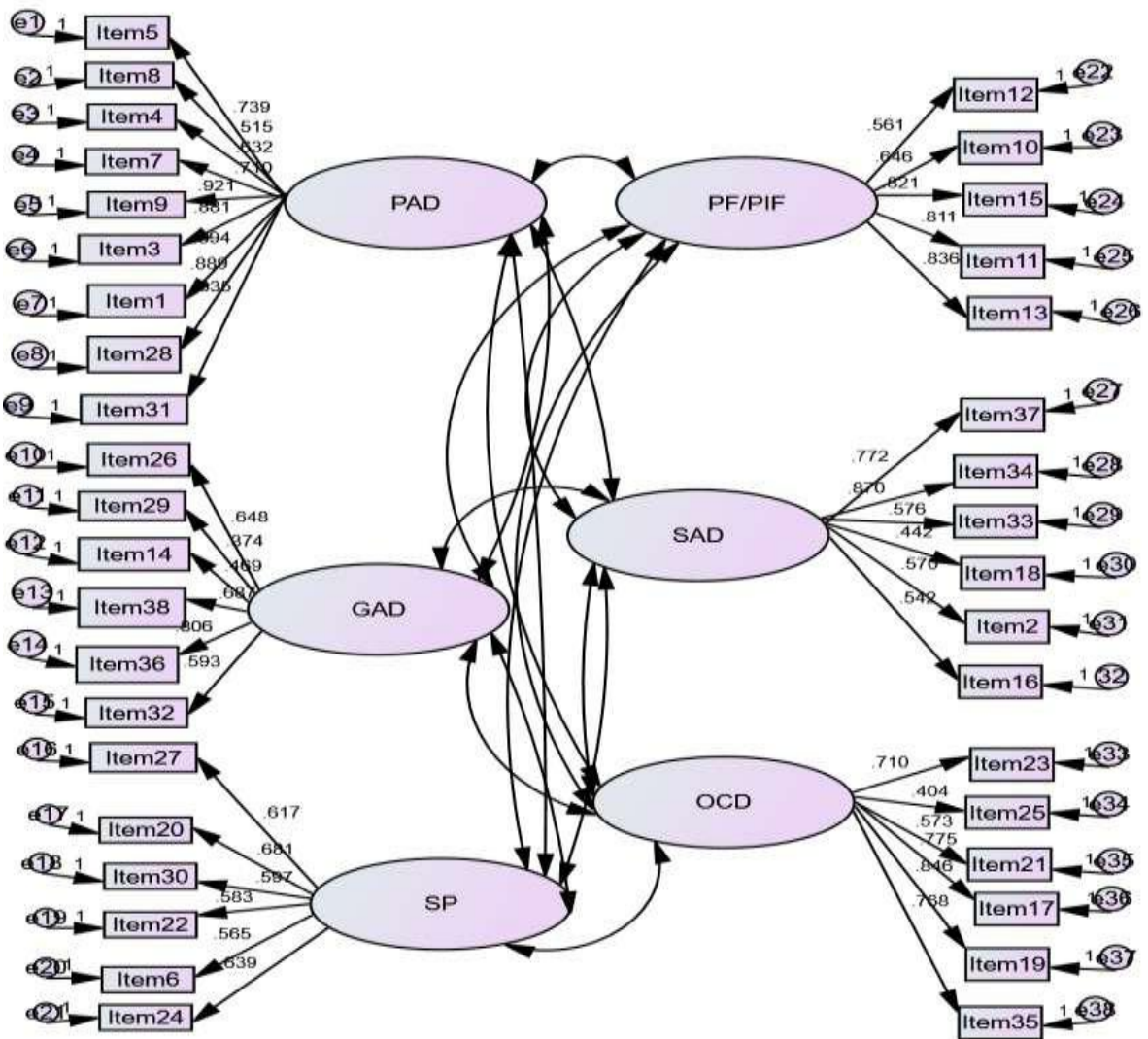
Model	RMSEA	CFI	PCFI	χ^2	p
Default model	.039	.980	.956	152.90	.000

RMSEA = Root Mean Square Error of Approximation, CFI= Confirmatory Factor Index, PCFI = Parsimony Confirmatory Factor Index, χ^2 = Chi-Square, p = Probability value

Table 5 shows the goodness-of-fit statistic and indices for the six-factor model for the SCAS. It shows that the default $RMSEA = .039$; $CFI = .980$, $PCFI = .956$, $\chi^2 (289) = 152.90, p < .050$. The goodness-of-fit indices for this model indicated an adequate model fit because the CFI value was higher than .90 and the $RMSEA$ value was less than .05. In other words, the model fitted the data generated from the administration of SCAS. Besides, the standardized regression weights for factor loadings for the five-factor model were statistically significant with the regression coefficients ranging between 0.404 and 0.921. Figure 1 shows the six-factor model diagram for the SCAS.

Figure 1

Six-factor correlated model diagram of the Spence Children's Anxiety Scale



IV. Discussion

The study sought the factorial validation of SCAS in terms of EFA and CFA in Nigerian primary schools. The results of the study revealed that the six subscales of SCAS demonstrated good internal consistency reliability indices ranging from 0.732 to 0.871 while the overall reliability index is 0.890. The goodness-of-fit indices for this model indicated an adequate model fit because the *CFI* value was higher than .90 and the *RMSEA* value was less than .05. In other words, the model fitted the data generated from the administration of SCAS. Besides, the standardized regression weights for factor loadings for the six-factor model were statistically significant with the regression coefficients ranging between 0.404 and 0.921. These results are in agreement with the validation results obtained by other researchers in different countries.

Spence (1997) reported the overall alpha for the SCAS to be .92, while the Cronbach alphas for the six subscales were .82 for panic-agoraphobic symptoms, .70 for separation anxiety, .70 for social phobia, .60 for physical injury fears, .73 for obsessive-compulsive, and .73 for generalized anxiety. Similarly, Essau et al. (2008), Essau et al. (2004), Ishikawa, Sato and Sasagawa (2009), Mellon and Moutavelis (2007), Whiteside and Brown (2008), Essau, Muris and Ederer (2002), Essau, Muris and Ederer (2002), Essau et al. (2011), Essau, Anastassiou-Hadjicharalambous and Munˆoz (2011) found high alpha coefficients for the SCAS. A confirmatory factor analysis using Australian children and adolescents showed that the six-factor had a higher-order model fit than the other models (four-factor and five-factor) (Spence 1997; Spence 1998). Buttressing these findings, Spence, Barrett and Turner (2003) and Essau, Anastassiou-Hadjicharalambous and Munˆoz (2011) found a strong support for a six-correlated factor model which involved six factors. On the contrary, studies that used the various translated versions of the SCAS have not consistently supported the six-factor model. For example, a 5-factor model showed better model fit using German (Essau et al. 2004), Chinese (Essau et al. 2008), and Japanese children (Ishikawa, Sato & Sasagawa 2009). Also, the four-factor structure showed a better model fit using South African children (Muris et al. 2002). Turkish children, Direktˆor and Serin (2017) found that the six-factor SCAS has strong psychometric properties.

These results have implications for the well-being and academic achievement of children in primary schools in Nigeria. The empirical evidence that SCAS demonstrated good construct validation, implies that a SCAS can be adopted as a self-report questionnaire for the identification of signs of test anxiety among children and prescribe adequate treatment at a record time. Over the years, the easy ways of identification of children with signs of test anxiety had been an issue of major concern to early childhood educators. Thus, the outcome of this study has contributed to the knowledge domain of early childhood research by validating Spence children's test anxiety scale in Nigerian primary schools. This finding implicates community development of the children in the sense that when the children's experience of anxiety are properly handled using the SCAS, they will better contribute to the development of their communities when they come of age.

V. Conclusion

Based on the findings of this study, the researchers concluded that SCAS is a reliable instrument that can be used to assess signs of test anxiety among children. Thus, school headteachers should be trained on how to use the instrument to assess signs of test-anxiety among primary school children in Nigerian schools.

Conflicts of interest

The researchers have no potential conflict of interest to declare.

Ethical Approval

Ethical clearance letter was obtained for the conduct of the study through the University of Nigeria Committee on research ethics.

Informed Consent

The children and their teachers were served with informed consent forms to fill and sign before the commencement of the recruitment process.

References

1. Abbo, C., Kinyanda, E., Kizza, R. B., Levin, J., Ndyabangi, S., & Stein, D. J. (2013). Prevalence, comorbidity and predictors of anxiety disorders in children and adolescents in rural north-eastern Uganda. *Child and adolescent psychiatry and mental health*, 7(1): 1-11.
2. Chavira, D.A., Stein, M.B., Bailey, K., et al. (2004). Child anxiety in primary care: prevalent but untreated. *Depress Anxiety*, 20:155–64.
3. Direktör, C&Serin, N.B (2017). Psychometric Properties of Spence Children's Anxiety Scale (SCAS). *EURASIA Journal of Mathematics Science and Technology Education*, 13(10), 6625-6636 DOI: 10.12973/ejmste/78194
4. DOI 10.1007/s10578-011-0232-7
5. Ene, C.U., Ugwuanyi, C.S., Okeke, C.I.O., Nworgu, B.G., Okeke, A.O., Agah, J.J., Oguguo, B.C., Ikeh, F.E., Eze, K.O., Ugwu, F.C., Agugoesi, O.J., Nnadi, E.M., Eze, U.N., Ngwoke, D.U., & Ekwueme, U.H. (2021). Factorial Validation of Teachers' Self-Efficacy Scale using Pre-Service Teachers: Implications for Teacher Education Curriculum. *International Journal of Higher Education*, 10(1). <https://doi.org/10.5430/ijhe.v10n1p113>
6. Essau, C.A., Anastassiou-Hadjicharalambous, X & Muñoz, L.C. (2011). Psychometric Properties of the Spence Children's Anxiety Scale (SCAS) in Cypriot Children and Adolescents. *Child Psychiatry Hum Dev*, 42, 557–568
7. Essau, C.A., Leung, P.W.L., Conrads, J., Cheng, H. & Wong, T (2008). Anxiety symptoms in Chinese and German adolescents: their relationship with early learning experiences, perfectionism and learning motivation. *Depress Anxiety*, 25, 801–810
8. Essau, C.A., Muris, P & Ederer, E.M (2002). Reliability and validity of the Spence Children's Anxiety Scale and the screen for child anxiety related emotional disorders in German children. *J Behav Ther Exp Psychiatry*, 33, 1–18.
9. Essau, C.A., Sakano, Y., Ishikawa, S & Sasagawa, S (2004). Anxiety symptoms in Japanese and in German children. *Behav Res Ther*, 42, 601–612

10. Essau, C.A., Sasagawa, S., Anastassiou-Hadjicharalambous, X., OlayaGuzma'n, B &Ollendick, T.M (2011). Psychometric properties of the Spence Child Anxiety Scale with adolescents from five European countries. *J Anxiety Disord*, 25, 19–27.
11. Ishikawa, S., Sato, H. &Sasagawa, S (2009). Anxiety disorder symptoms in Japanese children and adolescents.*J Anxiety Disord*, 23, 104–111
12. Karakaya, E., &Oztop, D. B. (2013). Kaygıbozukluğuolançocukveergenlerdebilişseldavranışçiterapi. *BilişselDavranışçıPsikoterapiveAraştırmaDergisi*, 2, 10-24.
13. Mellon, R.C. &Moutavelis, A.G (2007). Structure, developmental course, and correlates of children's anxietydisorder-related behaviour in a Hellenic community sample. *J Anxiety Disord*, 21, 1–21
14. Muris, P., Schmidt, H., Engelbrecht, P & Perold, M (2002). DSM-IV-defined anxiety disorder symptoms inSouth African children. *J Am Acad Child Adolesc Psychiatry*, 41:1360–1368
15. Nwokolo, C., Mokwelu, O.B & Eneasator, U. E. (2016). Effects of Meditation Technique on Test Anxiety Among Secondary School Students in Anambra State, Nigeria. *European Scientific Journal*, 13(32). <http://dx.doi.org/10.19044/esj.2017.v13n32p271>
16. Spence, S.H (1998). A measure of anxiety symptoms among children. *Behav Res Ther.*, 36, 545–566
17. Spence, S.H., Barrett, P.M & Turner, C.M (2003). Psychometric properties of the Spence Children's AnxietyScale with young adolescents. *J Anxiety Disord*, 17, 605–625
18. Spence. S.H (1997). The structure of anxiety symptoms among children: a confirmatory factor analyticstudy. *J Abnorm Psychol* 106, 280–297
19. Sweeney, L., Rapee, R.M., Crozier, W.R& Alden, L.E. (2005).*Social anxiety in children and adolescents: psychological treatments*. The Essential Handbook of Social Anxiety for Clinicians New York, NY: John Wiley & Sons, Ltd; 153–65.
20. Ugwuanyi, C.S.,& Okeke, C.I.O. (2020). Psychometric Properties of the Pain Self-Efficacy Questionnaire Using Nigerian University Students with Chronic Pain. *Indian Journal of Public Health Research & Development*, 11 (6):1517-1522.https://scholar.google.com/scholar?hl=en&as_sdt=0%2C5&q=Ugwuanyi%2C+C.S.%2C+%26+Okeke%2C+C.I.O.+%282020%29.+Psychometric+Properties+of+the+Pain+Self-Efficacy+Questionnaire+Using+Nigerian+University+Students+with+Chronic+Pain.+Indian+Journal+of+Public+Health+Research+Development%2C+11+%286&btnG=
21. Ugwuanyi, C.S., Ene, C.U., Okeke, C.I.O., Eze, U.U, Okeke, A.O., &Ikeh, F.E. Factorial Validation of Children's Depression Inventory in Primary Schools in Nigeria. *International Medical Journal*, 28(1), 12 – 15. Website: <https://www.imj-1994.com/>
22. Whitaker, S.J., Lowe, P &Lee, S. (2007). Significant predictors of test anxiety among students with and without learning disabilities. *Journal of Learning Disabilities*, 40(4),360–76.
doi:10.1177/00222194070400040601
23. Whiteside, S.P.& Brown, A.M (2008). Exploring the utility of the Spence Children's Anxiety Scales parentandchild-report forms in a North American sample. *J Anxiety Disord.*, 22,1440–1446