CHILDREN'S DEPRESSION

Factorial Validation of Children's Depression Inventory in Primary Schools in Nigeria

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ABSTRACT

Background/Objective: **The rate of feelings of depression among primary school children in Nigeria is quite alarming. This kind of feeling affects negatively the children's academic activities in school. Children's depression inventory (CDI) has been validated by researchers using children of several developed countries but none has been done using Nigerian children. Thus, this study carried out factorial validation of CDI in terms of both exploratory and confirmatory factor analysis using Nigerian children within the age of 3-10 years.**

Method: **The factor analysis approach was used for the study with a sample of 363 pupils. Kovacs (1992) 27-item CDI was adopted and validated. Principal component analysis with varimax rotation was used for the determination of the factors of the CDI. 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).**

Results: **The analysis showed that the items of CDI had a good internal consistency reliability index. The data also had a good model fit with confirmatory factor index (CFI) of 0.973 and root mean square error of approximation (RMSEA) of 0.048.**

Conclusion: **CDI is a stable instrument that can be used to diagnose feelings of depression among children.**

KEY WORDS

factor analysis, children depression inventory, Nigerian children, validation

INTRODUCTION

The rate of feelings of depression among primary school children in Nigeria is quite alarming. This kind of feeling affects negatively the children's academic activities in school. Depression is a state of temporary sadness, loneliness or emotional isolation that almost everyone feels from time to time (Donald & Jing, 2007). According to Donald and Jing (2007) major depressive disorder (MDD) is a consistent experience of deep, unshakable sadness and diminished interest in all activities for at least two weeks. According to Pineda, Martín-Vivar, Sandín, and Piqueras (2018), anxiety and depressive disorders are among the most common mental disorders during childhood and adolescence.

According to Donald and Jing (2007), depression in young people has both immediate and long-term detrimental effects when regarded categorically as a disorder and also as a dimension along a continuum of symptoms. Depression is a major public health challenge among students (Abedini, Davachi, Sohbaee, Mahmoodi & Safa, 2007; Eller, Aluoja, Vasar, & Veldi, 2006; Lei, Xiao, Liu & Li, 2016; Ovuga, Boardman & Wasserman, 2006). Studies show that there is a widespread of depression among students in Nigeria (Adewuya, Ola, Aloba, Mapayi & Oginni, 2006; Aniebue & Onyema 2008; Ibrahim, Kelly, Adams & Glazebrook, 2013; Peltzer, Pengpid, Olowu & Olasupo, 2013). It has been suggested that 2.6% of the world's child and adolescent population has a depressive disorder (Polanczyk, Salum, Sugaya, Caye, & Rohde, 2015). Between 15% and 70% of children and adolescents who are diagnosed with depression have a comorbid anxiety disorder (Pineda, Martín-Vivar, Sandín and Piqueras, 2018). Due to the negative consequences that symptoms of depression have on children's development, a preventive strategy of early detection and intervention is essential (Sánchez-Hernández, Méndez, & Garber, 2014).

Due to the difficulty in the clinical assessment of depression among children and adult, it is recommended that self-reports instrument can be used to quickly diagnose depression. According to Lewinsohn, Rohde, and Seely (1998), self-reports are useful instruments for both diagnoses and appraisal of treatment efficacy. The Children's Depression Inventory (CDI; Kovacs, 1992) is one of the most frequently used self-reports for the assessment of depressive symptomatology in infancy and adolescence (Masip, Amador-Campos, Gómez-Benito & Gándara, 2010).

The CDI was created from the Beck Depression Inventory (Beck, 1978) to be administered to children and adolescents of school age. Kovacs carried out two preliminary versions of the CDI in 1975 and 1976, in which she modified the scoring, the content, and the drafting of the items. CDI has been validated in different countries and is being used for easy identification of depression among children. According to Ivarsson, Svalander, and Litlere. (2006) as cited in Nassar, Damra, and Ghbari (2016), some Previous studies at Malaysia (Rosliwati, Rohayah, Jamil, & Zaharah, 2007), Spain (Davanzo et al., 2004), Denmark (Sorensen et al., 2005) and different parts of the world (Al- Balhan, 2006; Ghareeb & Beshai, 1989) have shown the CDI to be a reliable measure with a high internal consistency with Cronbach alphasranging from 0.71 to 0.89 which is similar to these reliability values reported at the English version. Nassar, Damra, and Ghbari (2016) found that the Jordanian version of CDI showed sufficient evidence to consider it as a

Received on April 8, 2020 and accepted on July 8, 2020

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Table 1: Demographic Characteristics of the Participants

Demographics characteristics		n (%)	χ^2	p
Gender	Male	97(26.72)		
	Female	266(73.28)	32.65	.000
Age	3-5	187(51.51)		
	6-8	100(27.55)	51.87	.000
	> 8	76(20.94)		
Tribe	Igbo	286(78.79)		
	Hausa	20(5.51)	72.91	.000
	Yoruba	57(15.70)		

χ^2 = Chi-square statistic, p = probability value

reliable and valid instrument in the Jordanian cultural context. Binagwaho *et al*. (2016) found that CDI reflected an overall good degree of accuracy as well as reasonable sensitivity and specificity using Rwandan Children.

Despite the above empirical evidence on the reliability of CDI in different countries, no research has been conducted in Nigeria, to validate the self-report instrument for assessing symptoms of depression among children. Thus, the researchers validated the Kovacs 27-item CDI in terms of EFA and CFA using a sample of Nigerian children.

METHODS

Participants

A total of 363 primary three (3) and four (4) pupils in primary school children in schools in the South-East States, Nigeria, formed the participants for the study. G-Power, version 3.1 software was used in generating an adequate sample size for this study which gave 0.91. The children were sampled through a multi-stage sampling procedure. At the first stage, 42 primary schools were randomly sampled for the population of primary schools in South-East states. 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 363 children who had signs of depression.

Table 1 shows the demographic characteristics of the participants for the study. It shows that 26.72% of the participants are male children while 73.28% are female children. In terms of age of the participants, 51.51% of the participants are within the ages of 3-5 years, 27.55% of the participants are within the ages of 6-8 years while 20.94% are more than 8 years of age. In terms of tribe, 78.79% of the participants are Igbo children, 5.51% are Hausa children while 15.70% are Yoruba children.

MEASURE

Children's Depression Inventory (CDI)

The Children's Depression Inventory developed by Kovacs (1992) was adopted for the study. The CDI is one of the most frequently used research measures of depression in children and consists of 27 items modeled on a 5-point Likert scale, each evaluating a symptom of depression or related effect. The CDI quantifies a range of symptoms of depression including 5 different dimensions: Negative Mood, Interpersonal Problems, Ineffectiveness, Anhedonia, and Negative Self-esteem. The internal consistency reliability coefficient of CDI 0.80, while the test-retest reliability coefficient 0.87. Out of the 27 items of CDI, 26 items were used for this study because a particular item that indicates suicidal tendencies was excluded. That was done to avoid the possibility that consciousness about a previously unconscious suicidal idea could raise in the child's mind (Moilanen, 1990). Samm *et al*., (2008) and Nassar, Damra, and Ghbari (2016) used the CDI 26-item version for the same reason.

Table 2: Kaiser-Meyer-Olkin (KMO) and Bartlett's Test for the Adequacy of the sample size for the exploratory factor analysis of children's depression inventory

Kaiser-Meyer-Olkin Measure of Sampling Adequacy. .		883
Bartlett's Test of Sphericity	Approx. Chi-Square	736.828
	df	325
	Sig.	.000

Administration of the CDI

The researchers sought and obtained written permission from the headteachers of the schools used for the study to enable them to administer the copies of the CDI. After that, the copies of the CDI were administered with the help of the primary school teachers in the schools visited. The children were given 30 minutes to fill out the CDI items. In the end, copies of the CDI were retrieved from the children 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 in SPSS was used to carry out EFA. CFA was carried out using IBM SPSS AMOS. The data for this study are at the custody of the corresponding author and can be provided when the need arises.

RESULTS

Table 2 shows that the KMO measure is 0.883 which shows that the sample size for the exploratory factor analysis of the CDI was very adequate. From the same Table 2, **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 CDI is not an identity matrix.

Table 3 shows that the eigenvalues associated with the rotated sums of square loadings ranged from 1.903 to 13.26 with the highest eigenvalue explaining 51.001% from the total variance, while the lowest eigenvalue explained7.321% from the total variance. The results further showed that the differences between extraction and rotation eigenvalues were small implying that the CDI items loaded strongly on the five factors at the extraction level. In essence, the researchers went further to rotate the iteration to have more item loadings as shown in Table 4.

The exploratory factor analysis in Table 4 shows that using Nigerian primary school children, five subscales of CDI were factored using prin-

Table 3: Extraction and rotation sum of squares loadings that associated with the Factors

	Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
Component	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
Negative Mood	13.648	52.494	52.494	13.260	51.001	51.001
Negative Self-esteem	4.817	18.526	71.020	3.755	14.443	65.444
Interpersonal Problems	2.968	11.417	82.436	3.058	11.763	77.207
Ineffectiveness	1.426	5.484	87.921	1.942	7.470	84.676
Anhedonia	1.060	4.076	91.997	1.903	7.321	91.997

Table 4: Rotated Component Matrix for the children's depression inventory Items

Item Statement	Negative Mood	Negative Self-esteem	Interpersonal Problems	Ineffectiveness	Anhedonia
Sadness	.971				
Loneliness	.970				
Irritability	.968				
Pessimistic worrying	.967				
Misbehavior	.965				
Self-hate	.937				
Self-blame	.937				
Crying spells	.935				
Indecisiveness	.935				
Fatigue	.935				
School dislike	.922				
Disobedience	.916				
Pessimism	.913				
Fighting	.899				
Self-depreciation	.868				
16. Feeling uninvolved		.920			
17. Negative body image		.918			
18. Reduced social interest		.883			
19. Reduced appetite		.861			
20. Lack of friends			.954		
21. Self-depreciation via peers			.949		
22. School performance decrement			.904		
23. School work difficulty				.955	
24. Sleep disturbance				.938	
25. Somatic concerns					.933
26. Anhedonia					.910

Extraction Method: Principal Component Analysis.

Rotation Method: Varimax with Kaiser Normalization.

a. Rotation converged in 5 iterations.

Table 5: Reliability of the Subscales of CDI

Subscale	Cronbach Alpha (α)
Negative Mood	.848
Negative Self-esteem	.762
Interpersonal Problems	.708
Ineffectiveness	.686
Anhedonia	.650
CDI	**.896**

Table 6: Model Fit Indices for the CDI Data

Model	RMSEA	CFI	$\chi 2$	p
Default model	.048	.973	361.586	.000
Independence model	.062	.948	782.149	.000

RMSEA = Root Mean Square Error of Approximation, CFI = Confirmatory Factor Index, $\chi 2$ = Chi-Square, p = Probability value

cipal 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 CDI. Out of the five subscales of CDI, 15 items loading highly on factor 1 (Negative Mood), 4 items loaded highly on factor 2 (Negative Self-esteem), 3 items loaded highly on factor 3 (Interpersonal Problems), 2 items loaded on factor 4 (Ineffectiveness) while 2 items loaded highly on factor 5 (Anhedonia).

Table 5 shows that the subscales of CDI demonstrated good internal consistency reliability indices ranging from 0.650 to 0.848. Negative mood subscale had a reliability index of 0.848, Negative self-esteem had a reliability index of 0.762, Interpersonal problems subscale had a reliability index of 0.708, Ineffectiveness subscale had a reliability index of 0.686 while Anhedonia subscale had reliability index of 0.650. CDI had an overall reliability index of 0.896.

Table 6 the goodness-of-fit statistic and indices for the five-factor model for the CDI. It shows that the default $\chi 2 = 361.586$; $df = 289$; $p < .050$; *RMSEA* = .048; *CFI* = .973. The goodness-of-fit indices for this model supported an adequate model fit in that the *CFI* value was higher than .90and the *RMSEA* value was less than .05. In order words, the model fitted the data generated from the administration of CDI. Besides, the standardized regression weights for factor loadings for the five-factor model were statistically significant with the regression coefficients ranging between 0.268 and 0.849. Figure 1 shows the five-factor model diagram for the CDI.

DISCUSSION

The study validated children's depression inventory in terms of the exploratory and confirmatory factor analysis using a sample of Nigerian children. The results showed that the items of CDI had a good internal consistency reliability index and the data also had a good model fit with confirmatory factor index (CFI) greater than 0.90 and root mean square error of approximation (RMSEA) less than 0.06. These results conform with the findings of previous validation research using samples of other countries. According to Ivarsson, Svalander, and Litlere (2006) as cited in Nassar, Damra, and Ghbari (2016), some Previous studies at Malaysia (Rosliwati, Rohayah, Jamil, & Zaharah, 2007), Spain (Davanzo *et al*., 2004), Denmark (Sorensen *et al*., 2005) and different parts of the world (Al- Balhan, 2006; Ghareeb & Beshai, 1989) have shown the CDI to be a reliable measure with a high internal consistency with *Cronbach alphas* ranging from 0.71 to 0.89 which is similar to these reliability values reported at the English version. Nassar, Damra, and Ghbari (2016) found that the Jordanian version of CDI showed sufficient evidence to consider it as a reliable and valid instrument in the Jordanian cultural context. Binagwaho *et al*. (2016) found that CDI reflected an overall good degree of accuracy as well as reasonable sensi-

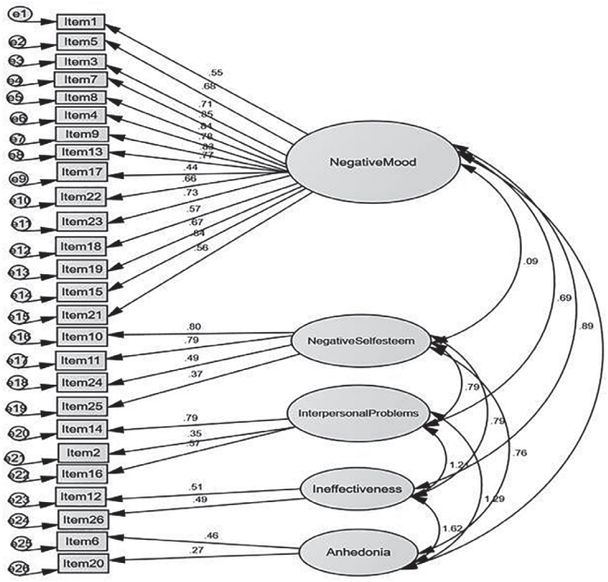

Figure 1: Five-factor Model Diagram for the confirmatory factor analysis of children's depression inventory Subscales

tivity and specificity using Rwandan Children. These findings have implications on the wellbeing of the children in the school system. The validated CDI can easily be used in Nigerian primary schools to diagnose feelings or symptoms of depression among the children rather than the clinical treatment of depression when the case must have been out of hand.

CONCLUSION

Based on the results of the study, the researchers concluded that CDI is a stable instrument that can be used to diagnose feelings of depression among children. Thus, school head teachers should be trained on how to use the instrument to assess symptoms of depression among primary school children in Nigerian schools.

ETHICAL CONSIDERATIONS

The University of Nigeria Committee on research ethics approved the conduct of this research. The authors also adhered to the ethical standard specification of the American Psychological Association APA (2017).

REFERENCES

Abedini, S., Davachi, A., Sohbaee, F., Mahmoodi, M., & Safa, O. (2007). Prevalence of depression in nursing students in Hormozgan University of Medical Sciences. *Hormozgan Medical Journal*, 11(2), 139-145.

Adewuya, A. O., Ola, B. A., Aloba, O. O., Mapayi, B. M., & Oginni, O. O. (2006). Depression amongst Nigerian university students. *Social Psychiatry and Psychiatric Epidemiology*, 41(8), 674-678.

AL-Balhan, E. (2006). The Children's Depression Inventory as a reliable measure for post-Iraqi invasion Kuwaiti youth. *The Journal of Social Behavior and Personality*, 34(2), 351-366. doi: 10.2224/sbp.2006.34.4.351

Aniebue, P. N., & Onyema, G. O. (2008). Prevalence of depressive symptoms among Nigerian medical undergraduates. *Tropical Doctor*, 38(3), 157-158.

Beck, A. T. (1978). *Depression inventory*. Philadelphia, PA: Center for Cognitive Therapy.

Binagwaho, A., Fawzi, M.C.S., Agbonyitor, M., & Kayiteshonga, Y (2016). Validating the Children's Depression Inventory in the context of Rwanda. MBC *Pediatrics*, 16: 29. DOI 10.1186/s12887-016-0565-2

Davanzo, P., Kerwin, L., Nikore, v., Esparza, C., Forness, S., & Murrelle, l. (2004). Spanish Translation and Reliability Testing of the Child Depression Inventory. *Child Psychiatry and Human Development*, 35 (1), 75-92. http://download.springer.com / static/pdf/276/art%253A10. 1023%252FB%253ACHUD.000039321.56041. cd.pdf?auth66=1415882583_ae9b0df4ff1bdce435d5c7871846bc62&ext=.pdf

Donald, S & Jing, S (2007). Resilience and Depression in Children: Mental Health Promotion in Primary Schools in China. International Journal of Mental Health Promotion, 9(4).

Eller, T., Aluoja, A., Vasar, V., & Veldi, M. (2006). Symptoms of anxiety and depression in Estonian medical students with sleep problems. *Depression and Anxiety*, 23(4), 250-256.

Ghareeb. A, G., Beshai. J, A. (1989). Arabic version of the children's depression Inventory: Reliability and Validity. *Journal of clinical child Psychology*, 18(4), 323-326. 10.1207/s15374424jccp1804_5

Ibrahim, A. K., Kelly, S. J., Adams, C. E., & Glazebrook, C. (2013). A systematic review of studies of depression prevalence in university students. *Journal of Psychiatric Research*, 47(3), 391-400.

Ivarsson, T., Svalander, P.& Litlere, O. (2006). The Children's Depression Inventory (CDI) as measure of depression in Swedish adolescents. A normative study. *Nord Journal of Psychiatry*, 60(3), 220-226. doi:10.1080/08039480600636395.

Kovacs, M. (1992). *Manual of the Children's Depression Inventory*. Toronto: Multi-Heath Systems.

Lei, X. Y., Xiao, L. M., Liu, Y. N., & Li, Y. M. (2016). Prevalence of depression among Chinese university students: A meta-analysis. *PLoS ONE*, 11(4), e0153454.

Lewinsohn, P., Rohde, P., & Seeley, J. R. (1998). Major depressive disorder in older adolescents: Prevalence, risk factors, and clinical implications. *Clinical Psychology Review*, 18, 765-794.

Masip, A.F., Amador-Campos, J.A., Gómez-Benito, J & Gándara, V.B. (2010). Psychometric Properties of the Children's Depression Inventory in Community and Clinical Sample. The Spanish Journal of Psychology, 13(2): 990-999.

Moilanen, I. (1990). Components of Childhood Depression. *Reports of Psychiatria Fennica Report*, 91, 85 1.

Nassar, Y H.., Damra, J K. M & Ghbari, T A F. (2016). Psychometric Characteristics of the Jordanian version of the Children's Depression Inventory. Inter. J. Edu. Res Technol. 7[1]: 27-34. DIO:10.15515/ijert.0976 4089.7.1.2734

Ovuga, E., Boardman, J., & Wasserman, D. (2006). Undergraduate student mental health at Makerere University, Uganda. *World Psychiatry*, 5(1), 51-52.

Peltzer, K., Pengpid, S., Olowu, S., & Olasupo, M. (2013). Depression and associated factors among university students in Western Nigeria. *Journal of Psychology in Africa*, 23(3), 459-465.

Pineda, D., Martín-Vivar, M., Sandín, B & Piqueras, J.A (2018). Factorial invariance and norms of the 30-item shortened-version of the Revised Child Anxiety and Depression Scale (RCADS-30). *Psicothema*, 30(2): 232-237. doi: 10.7334/psicothema2017.276

Polanczyk, G. V., Salum, G. A., Sugaya, L. S., Caye, A., & Rohde, L. A. (2015). Annual research review: A meta-analysis of the worldwide prevalence of mental disorders in children and adolescents. *Journal of Child Psychology and Psychiatry and Allied Disciplines*, 56(3), 345-365. doi:10.1111/jcpp.12381

Rosliwati, M., Rohayah, H., Jamil, B., Zaharah, S. (2007). Validation of Malay version of Children Depression Inventory (CDI) among children and adolescents attending outpatients clinics in kota bharu, kelantan. *The Mealaysia journal of medical science*, 14, 285-288.

Samm, A., Va¨rnik, A., Tooding, L. M., Sisask, M., Ko¨lves, K., & Knorring.A. L. (2008). Children's Depression Inventory in Estonia Single items and factor structure by age and gender. *Eur Child Adolesc Psychiatry*, 17(3), 16270. doi: 10.1007/s00787-007-0650-z

Sánchez-Hernández, O., Méndez, F. J., & Garber, J. (2014). Prevención dela depresión en niños y adolescentes: revisión y refl exión [Prevention of depression in children and adolescents: Review and refl ection]. *Revista de Psicopatología y Psicología Clínica*, 19(1), 63-76. doi: 10.5944/rppc. vol.19.num.1.2014.12983.

Sorensen, M. J., Frydenberg, M., Thastum, M., & Thomsen, Per. H. (2005). The Children's Depression Inventory and Classification of Major Depressive Disorder Validity and reliability of the Danish version. *Eur Child Adolesc Psychiatry*, 14(6), 328-334. doi: 10.1007/s00787-005-0479-2