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Research Article

The Factor Structure of the Adapted WHO Quality of Life BREF questionnaire in a sample of adolescents in Nigeria

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Abstract

The World Health Organization's Quality of Life Instrument (WHOQOL-BREF) is widely validated and popularly used in assessing perceived quality of life (QOL) of adolescents and the general population. Though the WHOQOL-BREF has been used in some studies in Nigeria, its theoretical structure has not been comprehensively investigated. This study examined the factor structure of the Adopted WHOQOL-BREF questionnaire and it theoretical structure in a large sample of adolescents in Nigeria. Data on demographic characteristics and QOL were extracted from 1,963 adolescents who participated in a state-wide study on psychosocial functioning and quality of life of adolescents in Benue State, Nigeria. Descriptive statistics were used to present the distribution of the data while Cronbach's alpha and Polychoric ordinal alpha were used to describe the internal consistency (reliability) of the adapted WHOQOL-BREF and alpha value of 0.700 was considered reliable. Structural analysis was performed to extract the underlying factors while confirmatory factor analyses were used to assess some hypothesized structure of the adapted WHO-QOL BREF. Relative Chi-square test value ≤3.0 was regarded a good fit while multiple fit indexes with values ≥0.90 (for acceptable fit) were used for assessing diverse aspects of the models. All analyses were performed at 5% significance level using IBM SPSS statistics version 20, R package and AMOS version 21. Participants were mostly male (54.8%) and 14.7±1.4 years old with 51.0% residing in rural areas. The overall internal consistency of the 4-factor model was 0.862 (for Cronbach's Alpha) and 0.989 (for Polychoric Alpha) while the 2-factor model had 0.870 (for Cronbach's Alpha) and 0.990 (for Polychoric Alpha). The Cattelle's Scree plot, Horn's parallel analysis and the confirmatory factor analysis revealed a 2-factor model as the best model for the WHO-QOL BREF. The 23-item 2-factor structure had a relative Chi-square test value with all fit indices within the acceptable range. The adapted WHO QOL BREF can be safely used to assess quality of life among Adolescents in Nigeria and related settings. Using the two factors extracted in the present study may yield better results in settings similar to the present study location.

Key Words: *WHO quality of life BREF, Adolescents, Structural analyses, Confirmatory factor analysis*

INTRODUCTION

The WHO's Quality of Life Group defines quality of life (QOL) as individuals' perceptions of their position in life in the context of the culture and value systems in which they live and in relation to their goals, expectations, standards and concerns (WHOQOL, 1991; Kasturi et al., 2010; Usefy et al., 2010). The short version of the World Health Organization Quality-100 called WHOQOL-BREF with 26 items and four domains of health, namely, physical, emotional/psychological, social relationships, and environmental is considered an equally valid and reliable alternative to the assessment of domain profiles used in the WHOQOL-100 (WHOQOL, 1991). It's remarkable results are reported in several epidemiological and clinical trials (Noerholam et al., 2004; Fairclough, 2002).

In contemporary research, there has been an increasing focus on measuring health beyond traditional indicators such as mortality and morbidity, and quality of life (QoL) has turned into an important outcome in clinical and interventional studies (Saharnaz et al., 2008; Fairclough, 2002). Simple and complex instruments for measuring quality of life abound in health care literature, and researchers have consistently integrated collections of subjective and objective indices which measure impact of disease and impairment on daily activities and behaviour, perceived health measures and disability/functioning status (Ware et al., 1993; David et al, 2004; Dejan et al., 2011; Ayuk et al., 2013; Onyiriuka & Ehkator, 2013). In many studies where assessment of quality of life is of interest, the WHOQOL BREF has been a ready instrument being adapted by researchers (Usefy et al., 2010; Onoja Matthew Akpa & Elijah Afolabi Bamgboye, 2015; Noerholam et al., 2004; Arash Mirabzadeh et al., 2013; O. Aloba et al., 2013; Adeolu Oladayo Akinboro et al., 2014).

As a result, examination of the psychometric properties of the WHOQOL-BREF has attracted the attention of health researchers across the globe (Min et al., 2002; Usefy et al, 2010; Noerholam et al., 2004; Fang et al., 2002). However, apart from inconsistencies in results across studies, these studies are limited in sample population and none of them was based in sub-Saharan Africa (Min et al, 2002; Usefy et al., 2008; Jude U. Ohaeri et al., 2007; Kasturi et al., 2010; Ping Xia et al., 2012).

Previous studies elsewhere have used confirmatory factor analysis and other techniques to assess if the original structure of WHOQOL BREF could be obtained from their observed data (Nedjat et al., 2008; Berlim et al., 2005; Trompenaars et al., 2005; Yao & Wu 2005; Izutsu, et al., 2005) while others

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have relied solely on descriptive statistics and Cronbach Alpha, not ruling out the likelihood of factor invariance (Yao & Wu. 2008; Chien et al., 2007). Although limited studies have assessed some aspects of the psychometric properties of the WHOQOL BREF in Nigeria (Akpa & Bamgboye, 2015; Aloba, Fatoye et al., 2013), a comprehensive documentation of the psychometric properties including the factor structure (especially among adolescents) in this setting is completely lacking in the literature.

The present study investigates the theoretical structure and selected hypothetical structures of the adapted WHOQOL-BREF questionnaire in a population of adolescents attending secondary schools in Benue State, Nigeria. Such information could guide future application of the instrument in similar population in Nigeria or closely related settings within sub-Saharan Africa and elsewhere.

MATERIALS AND METHODS

Study location: The primary survey was a state wide study involving a Local Government Area (LGA) from each of the three senatorial districts in Benue state (Oju, Vandekeya, Wannune) and the state capital.

Located in the middle-belt region of Nigeria with 23 local government areas, Benue State has an estimated population of about 4 million people (NBS, 2012). Approximately 725,936 adolescents are within the ages of 15-19years, 63.9% of whom are males. About 37% of the youth are currently in school, most of whom are in secondary school (NBS, 2012).

Participants and Procedures: Data were extracted for a total of 1,963 (1,065 boys and 895 girls) in-school adolescent who participated in the study Participants in the original survey were drawn from Girls-only schools (GOS), Boys-only Schools (BOS) and Gender-mixed Schools (GMS) to allow for a range of social backgrounds and academic orientations. Schools were purposively sampled based on their gender composition and large number of students. For the present analysis, the extracted data from all LGAs were combined and randomly split into two samples - Sample01 consisted of 980 (54.7% boys and 45.2% girls) participants while Sample02 consist of 983 (53.8% boys and 46.0% girls) participants.

Study Instruments/Measures: The adapted WHOQOL-BREF instrument is a 24-items, which measure the following broad domains of quality of life: physical health domain (PHD), psychological health domain (PSD), social relationship domain (SRD), and environmental domain (END). It is a short version of the original instrument that may be more convenient for use in large research studies (WHOQOL, 1991). Items are scored on a 3-point Likert-type scale indicating how each attribute applies to the responded (0=not true, 1=somewhat true, 2=certainly true).

The WHOQOL-BREF has been reported to have moderate to excellent reliability when used in selected population groups in sub-Saharan Africa. In particular, Adeolu et al (2014) reported an overall reliability of 0.85 for the WHOQOL-BREF in a sample of Nigerians living with human immunodeficiency virus while among ill-health and heathy adult in Northern Ethiopia, the overall estimate of reliability of the WHOQOL-BREF was 0.92 while domains' Cronbach's alpha ranged between 0.81 (for PHD) and 0.73 (END) (Elizabeth Mousley et al., 2013).

Data Management and Statistical Analysis: Descriptive statistics were used to present the distribution of the data. To assess the internal consistency of the instrument, Cronbach's Alpha ($\square$) and Polychoric ordinal alpha ($\square$p) were used and alpha value of 0.70 was considered reliable (Gadermann et al., 2012). Two separate Exploratory Factor Analyses (EFA) using principal-axis factoring extraction with a direct oblimin rotation were performed on the Sample01 data with the IBM SPSS Statistics, version 20. As presented in Akpa et al (2016), the first was to assess how each item of the WHOQOL-BREF loaded onto their respective original subscales while the second EFA was to investigate the structural model suggested by the data. In addition, Cattelle's Scree plot and Horn's parallel analysis, eigenvalues and the percentage of variance explained were used to determine the number of factors or components to be retained (Ladesma and Pedro, 2007). Items loads ≥0.30 (in absolute value) on the relevant factor (and <0.30 on all other factors) are considered to be statistically significant load on the respective factor(s) (Hair et al., 1998).

The original measurement model (4-factor model – Model B1) of the WHOQOL-BREF was investigated against two separate confirmatory factor analysis (CFA) models in AMOS version 21 using Sample02 data (Jamie, 1998). The first hypothetical CFA model; Model B2 was a 2-factor model with Factor 1 consisting of 20 items mainly from the social relationship domain, the Environment domain and few others from the Physical health and Psychological domains. Also Factor 2 of the B2 model consisted of two negatively worded items each from Physical health and the Psychological domains (Table 2). On the other hands, the second CFA, Model B3 was a modified Model B2 with 20 items in the first factor and three items in the second factor. Item QoL04 (You feel your life is meaningless) was removed from the second factor of Model B2 to form Model B3. Multiple fit indices and cut-offs were used to evaluate the model fit to the data. The global fit to the data was tested by Relative Chi-square test [ ] which adjust for sample size with a cut-off value of ≤3.0 for good fit, Root Mean Square Error of Approximation (RMSEA) with a cut-off value of ≤0.05 for an acceptable fit (Kline, 2011). Also, Goodness-of-fit Index (GFI), Adjusted Goodness-of-fit Index (AGFI), Comparative Fit Index (CFI), Incremental Fit Index (NFI) which test if the variables are uncorrelated and the Tucker-Lewis Index (TLI), all having cut-off value of ≥0.90 for an acceptable fit. Also, Consistent AIC (CAIC) which assigns greater penalty to model complexity was used for model comparison with smaller value indicating a better fit (Daire Hooperet al., 2008).

RESULTS

Participants' characteristics and item-level responses: Participants were 14.7±1.4 years old and mostly male (54.8%). The Sample01 (n=980) consisted of 54.7% boys and 45.2% girls aged 14.7±2.1 years while Sample02 consist of 53.8% boys and 46.0% girls aged 14.7±2.0 years. Approximately 46.0% (sample01) and 44% (sample02) of the adolescents resided in the rural areas while 49.0% (sample01) and 51.0% (sample02) lived in the Urban areas. The Ethnic composition of the adolescents in the sample01/sample02 were 57.3%/57.2% (for TIV), 7.9%/6.6% (for Idoma), 18.6%/19.6% (for Igede) and 15.5%/15.5% for others minority ethnic groups (Table 1).

Table 1:
Personal Characteristics of Respondents in Sample I & II

Variable		Sample01 (n=980) Frequency (%) Or Mean±SD	Sample02 (n=983) Frequency (%) Or Mean±SD	Test of equality of means Mean Diff (SE)	T test (p-value)
Current Age		14.72(2.054)	14.70(2.038)	0.011(0.092)	0.123(0.902)
	10-12years	147(15.0)	143(14.5)		
	13-17years	740(75.5)	747(76.0)		
	18-19years	93(9.5)	93(9.5)		
Gender					
	Male	536(54.7)	529(53.8)		
	Female	443(45.2)	452(46.0)		
	Not Reported	1(0.1)	2(0.2)		
Religion					
	Christianity	944(96.3)	938(95.4)		
	Islam	31(3.2)	38(3.9)		
	Not Reported	5(0.5)	7(0.7)		
Place of residence					
	Rural Area	448(45.7)	434(44.2)		
	Urban Area	480(49.0)	487(49.5)		
	Not Reported	52(5.3)	62(6.3)		
Tribe					
	TIV	562(57.3)	562(57.2)		
	Idoma	77(7.9)	65(6.6)		
	Igede	182(18.6)	193(19.6)		
	Others	152(15.5)	152(15.5)		
	Not Reported	7(0.7)	11(0.11)		

The Item-level descriptive analysis using the Sample01 data (Table 2) shows average scores on items ranged from 0.79±0.69 (for the item "You feel your life is meaningless") to 1.40±0.64 (for the item "You have negative feelings such as blue mood, despair, anxiety, depression"). Estimates of the skewness (and kurtosis) ranged from -0.59 (and -0.62) for the item "You have negative feelings such as blue mood, despair, anxiety, depression" to 1.38 (and 0.76) for the item "You feel your life is meaningless". This indicates that the data have no departure from the normal distribution.

Descriptive statistics, Inter-relationship and internal consistency of measures: Table 3, presents the results of the domain-specific inter-correlations, means and standard deviations (SD), including Cronbach's and the Polychoric Ordinal Alpha of the original subscales (4-factor model) of the WHOQOL-BREF.
All domains of the WHOQOL- BREF were inter-correlated (p<0.001), In particular, participants with poorer QOL scores on the psychological health, social relationship and environmental domains had high QOL scores on the physical health domain. On the other hand, participants with high scores on the psychological domain of the WHOQOL-BREF also had high scores on the social relationship and environmental domains. The hypothesized (extracted) two factors were negatively correlated (r=-0.177, p<0.001). The Polychoric Alpha coefficients for the four domains of the original 4-factor model of the WHOQOL-BREF were 0.829 (for the PHD), 0.601 (for the PSD), 0.641 (for the SRD), and 0.945 (for the END); indicating moderate to good reliability. The overall internal consistency of the 4-factor model was 0.862 (for Cronbach's Alpha) and 0.989 (for Polychoric Alpha) while the 2-factor model had 0.870 (for Cronbach's

Alpha) and 0.990 (for Polychoric Alpha) estimate of reliability, indicating that Cronbach's Alpha shrinks the reliability estimate of ordinal item response data when compared with Polychoric Alpha (Table 3).

Structural Analysis: The pattern coefficients matrix of the theoretical 4-factor model of the WHOQOL-BREF (Table 4) shows that some items did not load on their theoretical/original factor. Most Communalities (h2) values were low but the Kaiser-Mayer-Oklin measure of sample adequacy was 0.934 while the Bartlett's test of Sphericity was significant (=6142.006, p<0.0001) suggesting adequacy of the sample for factor analysis and the inclusion of each items in the analyses respectively.

The results of the exploratory factor analysis reveals eigen values for the four factors extracted were 6.89, 1.77, 1.17 and 1.06 (in that order). The first factor explained accounted for a total of 28.71% of the variance explained, the second factor accounted for 7.38% of the variance, the third accounted for 4.88% of the variance while the fourth factor explained 4.40% of the variance (Table 4). Subsequent on the distorted results observed in the factor loading of items onto the original 4-factor model of the WHOQOL-BREF, a parallel analysis (Table 5) was conducted to determine the number of significant factors that should be extracted. A factor will be retained for EFA if its eigenvalue is larger than the adjusted eigenvalue obtained from the parallel analysis (O'Connor, 2000; Hayton et al., 2004; Pinterits et al., 2009). The results of the parallel analysis (Table 6) and the Scree parallel plot (Figure 1) show that only two eigenvalues from the data set were larger than the adjusted eigenvalue from the randomly generated data. Hence, only two factors were extracted in the second EFA.

Table 2
Descriptive Statistics for the 24-items on the (Adapted WHO-QOL BREF) Quality of Life Questionnaire (QoL) using Sample I

Item Code	Labels	Mean/Median	SD/IQR	Skew	Kurtosis
QoL01	You feel that physical pain prevents you from doing what you need to do*	1.21	0.63	-0.20	-0.62
QoL05	You need some medical treatments to function in your daily life*	1.28	0.70	-0.44	-0.90
QoL09	You have enough energy for everyday life	1.21	0.69	-0.31	-0.89
QoL12	You are satisfied with your sleep	1.10	0.66	-0.11	-0.73
QoL15	You are able to get around well	1.06	0.65	-0.05	-0.63
QoL18	You are satisfied with your capacity to work	1.03	0.70	-0.04	-0.97
QoL22	You are satisfied with your ability to perform your daily living activities	1.08	0.72	-0.13	-1.07
QoL02	You do enjoy life	1.16	0.62	-0.12	-0.52
QoL04	You feel your life is meaningless	0.00[#]	1.00[§]	1.38	0.76
QoL10	You are able to concentrate	1.23	0.64	-0.24	-0.68
QoL13	You have negative feelings such as blue mood, despair, anxiety, depression*	1.40	0.64	-0.59	-0.62
QoL20	You are able to accept your bodily appearance	1.13	0.69	-0.17	-0.92
QoL24	You are satisfied with yourself	1.21	0.78	-0.38	-1.27
QoL03	You are satisfied with you with your personal relationships	1.17	0.69	-0.24	-0.93
QoL14	You are satisfied with the support you get from your friends	0.93	0.69	0.09	-0.90
QoL16	You are satisfied with your relationship with people of opposite sex	0.88	0.71	0.17	-1.03
QoL06	You feel safe in your daily life	1.17	0.71	-0.25	-1.00
QoL07	You live in a healthy physical environment	1.28	0.76	-0.51	-1.12
QoL08	You are satisfied with your access to health services	1.16	0.75	-0.27	-1.21
QoL11	You have enough money to meet your needs	0.82	0.68	0.24	-0.86
QoL17	You have available information that you need in your day-to-day life	0.97	0.70	0.04	-0.99
QoL19	You have enough opportunity for leisure activities	1.03	0.66	-0.03	-0.71
QoL21	You are satisfied with the condition of your living place	1.07	0.75	-0.12	-1.22
QoL23	You are satisfied with your transport	0.97	0.75	0.05	-1.21

Table 3.
Factor Correlations, Descriptive statistics & Reliabilities coefficients of the 4 Subscales & 2-factor model of the adaptive WHOQOL-BREF

	PHD	PSD	SRD	Factor 1	M	SD	α	α_p	α[#]	α_p[#]
Existing subscales of WHOQOL-BREF										
PHD					7.98	2.493	0.561	0.829		
PSD	.570*				6.51	1.954	0.358	0.601		
SRD	.455*	.450*			2.99	1.464	0.475	0.641		
END	.674*	.680*	.531*		8.46	3.766	0.807	0.954		
Overall					25.93	8.143	0.862	0.989		
2-factor Model of WHOQOL-BREF										
Factor 1					21.66	8.156	0.897	0.991	0.897	0.991
Factor 2				-.177*	3.89	1.383	0.486	0.578	0.095	0.044
Overall					25.55	8.163	0.870	0.990		

* - Significant correlations (p < .001), level,
α=Cronbach Alpha,
α_p=Polychoric Ordinal Alpha
#- Estimates is before dropping the item "You feel your life is meaningless" with a negative correleated item-total correlation value of -0.286

Table 4.
Communality, Rotated Factor Pattern Matrix of the (Adapted WHO-QOL BREF) Quality of Life Questionnaire

Item code	Label	Factor				h^2
		PHD	**PSD**	**SRD**	**END**	
QoL01	You feel that physical pain prevents you from doing what you need to do*	-.013	**.562**	.063	.097	.335
QoL05	You need some medical treatments to function in your daily life*	.008	**.484**	.049	-.036	.237
QoL09	You have enough energy for everyday life	.038	-.032	-.035	**-.657**	.480
QoL12	You are satisfied with your sleep	-.028	.044	.116	**-.540**	.268
QoL15	You are able to get around well	**.340**	-.093	-.263	-.150	.365
QoL18	You are satisfied with your capacity to work	**.435**	-.018	.028	-.246	.401
QoL22	You are satisfied with your ability to perform your daily living activities	**.645**	.028	.008	-.072	.482
QoL02	You do enjoy life	.035	-.051	-.136	**-.457**	.278
QoL04	You feel your life is meaningless	-.018	**-.468**	**.309**	-.069	.307
QoL10	You are able to concentrate	.130	.042	-.122	-.327	.223
QoL13	You have negative feelings such as blue mood, despair, anxiety, depression*	-.027	**.392**	.016	-.073	.161
QoL20	You are able to accept your bodily appearance	**.424**	-.041	-.295	.012	.338
QoL24	You are satisfied with yourself	**.671**	.155	-.052	-.022	.490
QoL03	You are satisfied with you with your personal relationships	.198	.100	.029	-.252	.176
QoL14	You are satisfied with the support you get from your friends	**.569**	-.068	.064	-.048	.363
QoL16	You are satisfied with your relationship with people of opposite sex	**.390**	-.087	-.004	.073	.134
QoL06	You feel safe in your daily life	.040	-.080	**-.453**	**-.433**	.501
QoL07	You live in a healthy physical environment	.154	.041	-.188	**-.466**	.427
QoL08	You are satisfied with your access to health services	.130	.028	.019	**-.546**	.416
QoL11	You have enough money to meet your needs	.222	-.124	.144	**-.432**	.380
QoL17	You have available information that you need in your day-to-day life	**.386**	-.112	-.095	-.147	.314
QoL19	You have enough opportunity for leisure activities	**.420**	-.062	-.122	-.097	.306
QoL21	You are satisfied with the condition of your living place	**.574**	.133	.052	-.123	.428
QoL23	You are satisfied with your transport	**.628**	.058	.097	-.078	.437
	Eigenvalues	6.890	1.771	1.172	1.055	
	% Variance Explained	28.708	7.381	4.883	4.397	

* *Negatively worded item*

Table 5.
Results of Horn's Parallel Analysis for component retention

Component	Adjusted Eigenvalue	Unadjusted Eigenvalue	Estimated Bias
1	6.598	6.89	0.292
2	1.524	1.771	0.248

Adjusted eigenvalues > 1 indicate dimensions to retain (2 components retained)
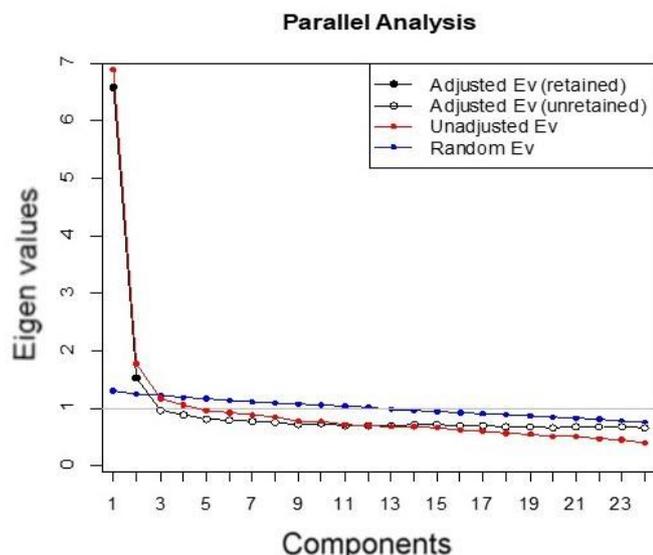
Parallel Analysis

Figure 1:
Scree Parallel Plot and Scree Simulation Plot

The pattern coefficients matrix of the second EFA (a hypothesized 2-factor- model) of the Adapted WHO-QOL BREF showed that twenty (20) items loaded on the first factor/component (consisting mostly of items in the theoretical physical health psychological domain social relationship and environmental) while the remaining four (4) items loaded on the second factor with 36.09% total variance explained.

Confirmatory factor Analysis
The results of the three CFA models and estimates of the fit indices confirmed the structure identified by the second structural analyses (2-factor model) as the best model in this sample of adolescents studied. The estimated correlation between the latent variables as well as the modified standardized path coefficients for the 2-factor model were statistically significant (Figure 2). The overall model goodness of fit ($\chi2/df = 2.98$, $p < .001$) shows that Model 3 best fits the independent dataset. The RMSEA for the 2-factor (Model 3) solution was 0.045, which is approximately equal to the cut-off value of 0.05 and indicated a relatively good fit of the factor model to the data (Daire Hooper et al., 2008; Yang and Montgomery, 2011; Akpa et al., 2015). The fit indices (GFI=0.941, AGFI=0928, CFI=0.907, NFI=0.867, and the TLI=0.895) and the Consistent Akaike information criteria (CAIC=1073.62) confirmed that Model B3 fits the independent dataset better than the other two models in the analysis (Table 7).

On the other hand, the Confirmatory Factor Analysis of the theoretical 4-Factor model (Model 1) revealed a poor fit with a $\chi2/df$ exceeding 3.0 ($\chi2/df = 4.19$). The RMSEA for the 4-Factor (Model 1) solutions (RMSEA=0.057) was above the cut-off value of 0.05 and indicated a poor fit of the 4-Factor (Model 1) to the data (Daire et al., 2008; Yang and Montgomery, 2011; Akpa et al., 2015) (Table 7).

Table 6.
Communality, Rotated Factor Pattern Matrix of the (Adapted WHO-QOL BREF) Quality of Life Questionnaire

Item code	Label	Component 1	Component 2	h^2
QoL09	You have enough energy for everyday life	.639		.407
QoL12	You are satisfied with your sleep	.415		.178
QoL15	You are able to get around well	.551		.319
QoL18	You are satisfied with your capacity to work	.626		.394
QoL22	You are satisfied with your ability to perform your daily living activities	.670		.451
QoL02	You do enjoy life	.496		.246
QoL10	You are able to concentrate	.462		.214
QoL20	You are able to accept your bodily appearance	.491		.249
QoL24	You are satisfied with yourself	.665		.444
QoL03	You are satisfied with you with your personal relationships	.403		.170
QoL14	You are satisfied with the support you get from your friends	.560		.331
QoL16	You are satisfied with your relationship with people of opposite sex	.307		.115
QoL06	You feel safe in your daily life	.580		.339
QoL07	You live in a healthy physical environment	.632		.401
QoL08	You are satisfied with your access to health services	.608		.370
QoL11	You have enough money to meet your needs	.549		.314
QoL17	You have available information that you need in your day-to-day life	.537		.311
QoL19	You have enough opportunity for leisure activities	.531		.294
QoL21	You are satisfied with the condition of your living place	.630		.400
QoL23	You are satisfied with your transport	.625		.391
QoL01	You feel that physical pain prevents you from doing what you need to do*		.560	.341
QoL05	You need some medical treatments to function in your daily life*		.492	.242
QoL04	You feel your life is meaningless		-.410	.168
QoL13	You have negative feelings such as blue mood, despair, anxiety, depression*		.408	.166
	Eigenvalues	6.890	1.771	
	% Variance Explained	28.708	7.381	

Pattern matrix coefficients with values of .30 or greater highlighted
* Negatively worded item

Table 7
Summary of Fit Indices of the Confirmatory Factor Analyses

Fit Indices	Models		
	Model B1	Model B2	Model B3
χ^2	1031.43*	798.90*	671.20*
df	246	229	225
CGF	4.19	3.45	2.98
RMR	0.024	0.023	0.021
GFI	0.91	0.929	0.941
AGFI	0.89	0.914	0.928
PGFI	0.726	0.771	0.768
NFI	0.801	0.842	0.867
RFI	0.777	0.825	0.85
IFI	0.841	0.882	0.907
TLI	0.821	0.869	0.895
CFI	0.84	0.881	0.907
PRATIO	0.891	0.905	0.889
PNFI	0.714	0.76	0.771
PCFI	0.749	0.797	0.807
NCP	785.43	567.9	446.2
RMSEA	0.057	0.05	0.045
AIC	1139.43	892.9	773.2
BIC	1403.52	1901.76	1022.62
CAIC	1457.52	1169.76	1073.62

x^2 =Chi-square statistics; df=degree of freedom; CGF=Chi-square Goodness-of-Fit; RMR=Root mean square residual; GFI=Goodness-of-Fit index; AGFI= Adjusted Goodness-of-Fit index; PGFI=Parsimony Goodness-of-Fit Index; NFI=Normed-fit index; RFI=Relative fit index; IFI=Incremental fit indices; TLI=Tucker-Lewis index; CFI=Comparative fit index; PRATIO=Parsimony ratio; PNFI=Parsimonious Normed-fit index; PCFI= Parsimonious Comparative fit index; NPC=Noncentrality parameter; RMSEA=; AIC=Akaike's information criterion; BCC=Browne-Cudeck criterion; BIC=Bayesian information criterion; CAIC=Consistent AIC. *Significant at 1% level of significance

DISCUSSION

The purpose of the current study was to examine psychometric properties of the Adapted WHO-QOL BREF. Previous evaluation of the scale using data obtained from the United Kingdom in a sample of adolescents (studied during the design of the WHOQOL-BREF) had confirmed the four components based on a self-reports survey (Kasturi et al., 2010; Sik-Yum Lee et al., 2005). Unfortunately, the present analysis did not establish the four factors in the current sample of adolescents. Polychoric alphas, Parallel analysis, and three CFA models were part of the additional psychometric properties reported in this present analysis.

Our results show that when Nigerian adolescents are reporting their perceived quality of life (QoL) using the WHOQOL-BREF questionnaire they are most likely to be reporting based on two underlying factors or conceptions. One of the conceptions was "positive self-perception" which was mainly correlated with all the items intended to measure social relationship and environment as well as few items from the physical health and the psychological domains of the WHOQOL BREF. The other concept was "negative self-perception" which correlated well with the three negatively worded items in the original WHOQOL-BREF and one item "You feel your life is meaningless" which was intended to measure their psychological health. This is not suprising as previous studies (Xia et. al., 2012; Fu et. al., 2013) have reported the item "You feel your life is meaningless" as been problematic in the validation of the WHOQOL-BREF among healthy adolescents and the negatively worded items were suggested to be removed when assessing the perceieved quality of life of adolescents (Kasturi Agnihotri et al., 2010). Notwithstanding, our finding differ from what had been reported in previous studies (Usefy et al., 2010; Xia et al., 2012; Kasturi Agnihotri et al., 2010; Nedijat et. al., 2008; Szu-Ting Fu et al., 2013) but substancial similarity with our findings would have been observed in the results published by these literatures if the items in the WHOQOL BREF were allowed to correlate freely as obtain in our analyses.

The internal consistency examined using Cronbach's alpha and Polychoric coefficients reveals moderate to high reliability in the original 4-factor WHOQOL-BREF with Environment domain having the highest coefficient which is similar to previous studies by Kasturi Agnihotri et al., (2010) and Nedijat et al., (2008). Although, the 4-factor shows good reliability estimates, the 2-factor WHOQOL-BREF as confirmed by parallel analysis and Exploratory Factor Analysis showed better reliability estimates with the first factor having the highest estimate. However, when the item (You feel your life is meaningless) was dropped in the second factor there was a considerable rise in the internal consistency estimate from 0.095 to 0.486 (for Cronbach's Alpha) and 0.044 to 0.578 (for Polychoric Alpha). Also with a correleated item-total correlation value of -0.286. This may imply that it is not unlikely that adolescents in this setting are more positively inclined about their life situations as demonstrated by Kasturi Agnihotri et al., (2010) in a similar study among healthy in-school Indian adolescents where WHOQOL-BREF items having negative correleated item-total correlation values below 0.3 were dropped during analysis because such items reduce the internal consistency of the scale.
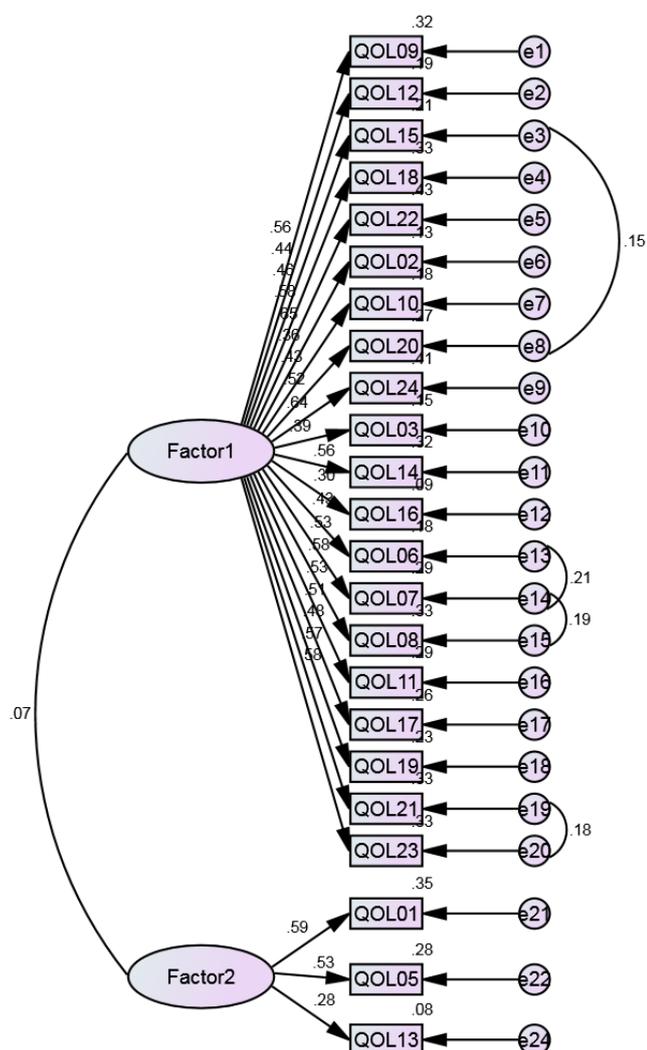
Figure 2.
Modified Standardized estimates for the 2-factors, 23-items of the Adapted WHO-QOL BREF

Furthermore, 3 CFA models were conducted to explore the dimensions that underlie response of adolescents to the adopted WHO-QOL BREF. The result of the 4-factor model does not provide good fit indices to the second independent sample dataset. Though the reliability estimates of these factors appeared to be within acceptable range, a negatively correlated 2-factor model gave a good fit to the independent dataset. This result is different from the models tested among Indian (Kasturi Agnihotri et al., 2010) and English (Sik-Yum Lee et al., 2005) adolescents. These studies used adopted WHO-QOL BREF instrument with 24 items plus two items for overall QOL and general health measured on a 5-points likert scale. To be more specific, the study by Sik-Yum Lee et al., 2005 used a sample of the dataset that was used in the initial design of the adopted WHO-QOL BREF instrument. This is similar to model testing and not instrument validation as explained by Jamie (1998). Also, the methodology used in the instrument validation in the Indian adolescents' population was questioned by Hengqing et al., (2010) and Gadermann et al., (2012).

The current properties of the adopted WHOQOL-BREF may not be unexpected as many previous studies assessing factor structure of the 4-factor model were studies among adults that were a mixture of ill, healthy or both (Ohaeri et al,

2007; Usefy et al., 2010; Xia et al., 2012; Nedijat et al., 2008; Szu-Ting Fu et al., 2013). The conclusion in many of these studies are problematic as participants' ill health status is a potential confounder when assessing quality of life using the WHOQOL BREF rather than, disease specific instruments that can be used among ill health population. Also, findings from these studies had relied mostly on the reliability coefficients of the domains of the original WHOQOL-BREF with no considerations for the probability of factor invariance (Yao & Wu. 2008; Chienet al., 2007), these method of validation deviates from the principles of instrument validation (Jamie, 1998; Burton & Mazerolle, 2011; Akpa et. al., 2016).

The present study suffers a number of limitations worth reporting. For instance, although efforts were made to ensure that very viable and robust data were collected, the cross-sectional nature of the original study did not permit assessment of any causal effect of the independent variables (Akpa et. al., 2015). Also, a study comprising all categories of adolescents (irrespective of schooling status) would have provided a more generalizable data than the parent study design which was limited to only in-school adolescents. Notwithstanding, the use of Polychoric alpha, parallel analysis and the CFA in the present study is a noble information from the present setting on the WHOQOL-BREF and a further contribution to what may have been reported in some studies on the WHOQOL-BREF elsewhere. In conclusion, though the WHOQOL-BREF is a well validated instrument with wide applicability, its original 4-factor model does not suite the experience of adolescents in the present setting but the observed data give a strong evidence of interrelationships between the domains. Future use of the WHOQOL-BREF among adolescents in this setting may consider a more inclusive population and a comparative evaluation of the original model and the 2-factor model

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