Development and Validation of the Redeemer's University Adverse Childhood Experiences Scale

[1, 2] Ojo, Taiye Emmanuel, [1]Akintola, Aderonke A., [1]Ogunsemi, Joshua O., [2]Sekoni, Tayo T, [2]Adekoya, Toluwalase S. & [3]Sama, Benedict O.

[1]Redeemer's University, Nigeria.
[2] Lagos State University, Nigeria
[3]Citicare Psychological Services Centre

Assessing adverse experiences is essential when considering their long-term effects on individuals and the health of communities. This study aimed to develop and validate the *Redeemer's University Adverse Childhood Experience Scale* (RUACES) among Nigerian adolescents. A cross-sectional study was conducted in Lagos State, Southwest Nigeria; 316 participants (147 males and 169 females) were selected among in-school adolescents from Lagos State between the ages of 11–19 years (Mean = 15.5; *SD*=1.66). An initial 45 items were generated through FGD and a thorough literature search. An exploratory factor analysis (EFA) using principal component analysis was used to extract 14 components. Of the 45 items, 18 loaded optimally on the first factor, 3 on the second, and 2 on the fourth and eighth factor. Items in the first and second components were retained, while others were removed due to their complex structure and insufficiency. Cronbach's alpha for the RUACES was found to be .87. Concurrent validity coefficients between RUACES and *Benevolence Childhood Experiences* and between RUACES and *Childhood Trauma Questionnaire* were found to be r = -.325 ($p < 0.001$) and r = .367 ($p < 0.001$), respectively. Based on these results, the *Redeemer's University Adverse Childhood Experience Scale* exhibits adequate psychometric qualities. The scale can be used in an educational centre and child and adolescent clinic to assess adolescents who experienced adversity during childhood and are currently experiencing adversity.

Keywords: Development, Validation, ACEs, psychometrics, RUACES, and Adverse childhood experiences.

Individuals' physical, psychological, and social well-being are strongly influenced by their childhood experiences (Daines et al., 2021). Adverse Childhood Experiences (ACEs), which range from physical

Author info: Correspondence should be sent to: Dr. Ojo T.E, Department of Psychology, Redeemer's University, Ede, Osun State, Nigeria, ojotaiyeemmanuel@gmail.com

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abuse to family dysfunction, have been identified as important predictors of detrimental adult health and behavioural challenges (Webster, 2022). Such experiences are some of the most intense and common stress causes that children may face early in life. Multiple sorts of abuse, such as neglect, violence between parents or caregivers, various types of major family dysfunction such as alcohol and substance misuse, and peer, communal, and collective violence are examples of such experiences (Kazeem, 2015). Studies on ACEs provide a fascinating insight into how we become who we are as individuals and as a society (Anda et al., 2009). ACEs are unexpectedly widespread, occur in "the best of families," and have long-term, negative implications (Daines et al., 2021). ACE studies have found a strong link between childhood emotional experiences and adult physical and mental health, as well as the leading causes of adult mortality and crime (Trivedi et al., 2021; Webster, 2022). Studies in numerous high-income nations as well as low and middle-income countries demonstrate that the impacts of adverse childhood experiences (ACE) have been related to physical, mental, and maladaptation in adulthood (Hughes et al., 2017; Kidman et al., 2020; Manyema, 2019; Tzouvaraet et al., 2023). Furthermore, ACEs have repeatedly been related to mental health problems in both children and adults. (Baglivio & Wolff, 2021; Baldwin et al., 2023; Trivedi et al., 2021). According to Crouch et al. (2018), children who are exposed to alcohol or brought up by parents diagnosed with psychological disorders have a high probability of experiencing psychological disorders or conduct problems. These children are also at a higher chance of experiencing a range of other negative childhood events, such as being mistreated or neglected, viewing domestic violence, and being exposed to drug-abusing, mentally ill, suicidal, or criminal family members. Also, psychological disorders, attempts to commit suicide, high-risk behaviours including smoking, alcohol drinking, drug addiction, and high-risk sexual activities have all been linked to ACEs. (Sharratt et al., 2023; Turner et al., 2018; WHO, 2020). Other implications of ACE include decreased adult educational achievement, decreased mental abilities, and a higher likelihood of certain diseases that are not transmissible, such as cardiovascular disease, cancer, chronic lung disease, bone fractures, and liver disease (Felitti et al., 2019). Based on these findings of prior studies, such outcomes underline the importance of developing a reliable method for assessing adverse experiences in childhood.

The *Adverse Childhood Experiences International Questionnaire* (ACE-IQ) has received several validations from many nations (Brown et al., 2009; Felitti et al., 1998; W.H.O, 2020). However, a few studies on the psychometric properties of the ACE-IQ have been conducted in

Nigeria (Agbaje et al., 2021; Folayan et al., 2020; Kazeem, 2015). All these researchers validated the existing scale adopted from the Western culture, but the current scale focuses on the African, especially in Nigeria's cultural context. Examining these different ethnic and cultural backgrounds in assessing adverse childhood experiences among adolescents, there is a need to develop and validate an Indigenous ACE questionnaire using a Nigerian culture sample and making the test available for people living in Nigeria. Furthermore, most scales assessing adverse childhood experiences have focused on young adults aged 18 years and above Agbaje et al., 2021; Brown et al., 2009; Folayan et al., 2020; Kazeem, 2015; W.H.O, 2022), whilst this current scale focuses on adolescents from 13 years to 19 years. In this regard, the ACE scale is useful for adolescents whose behaviours are affected due to their exposure to adverse early childhood experiences. The present research aims to fill a gap in the scientific literature by developing, validating, and establishing the reliability of the ACE measure as an assessment instrument for adverse childhood experiences and their influence on adolescent outcomes.

METHOD

This study employed a cross-sectional design to collect participants' responses regarding their adverse childhood experiences. It was conducted among in-school adolescents in both public and private Lagos State, Southwestern Nigeria.

Item Generation

The items on the scale were created after a Focus Group Discussion (FGD) and a thorough literature search on online libraries on childhood-related abuses at the local and international levels to gather information among in-school adolescents regarding different forms of maltreatment during childhood in Nigeria. Some acts of abuse were removed from the list since these were regarded as inapplicable, non-relevant, unusual in frequency, contentious or better conducive to a qualitative methodology. An initial 60 items were generated. Experts in psychology were contacted to evaluate the items for content and face validity, as well as their importance, depth, and cultural suitability. Experts came from academic research in various fields of psychology (Five clinical psychologists, two child psychologists, one developmental psychologist, one counselling psychologist, and two industrial and organizational psychologists). All the items were scored on a 5-point Likert scale, with one being irrelevant and four being relevant. The content validity ratio (CVR) was utilised to determine item inclusion based on the total number of experts agreeing on an item, as described by Yamada et al. (2010). All items marked as

'irrelevant' were expunged, and those marked as needed rephrasing for clarity were reworded. In contrast, those marked as 'Highly relevant' were retained based on the experts' independent assessment and agreement using the recommended 75% item inclusion criteria. Based on this process, a final version of 45 items was retained and subjected to scale refinement.

Participants

Sample Size Determination A Rule-of-thumb approach was used to calculate the sample size. One common rule of thumb for determining the sample size for factor analysis is to have between 5 and 10 respondents per item. This rule provides a straightforward method to estimate the minimum and maximum sample sizes needed for robust analysis. Thus, for a scale with 45 items, the calculated sample size was 315. However, 316 questionnaires were administered to cater for incomplete filling, and their responses were subjected to factor analysis.

The study participants were adolescents attending secondary school in Lagos State. A convenient sampling technique was adopted to collect data from 316 (147 males and 169 females) secondary school students aged 11 – 19 years (Mean = 15.5; *SD*=1.66). The researchers randomly selected Community Secondary School, Ikotun High School and Sigma Private School, Lagos State.

Data Collection Procedure The researchers obtained verbal assent from the participants' teachers, principal, proprietor/proprietress and parent before administering the instrument. Also, voluntary participation was ensured, and the participants were assured confidentiality and anonymity. Inclusion criteria were adolescents between the age range of 11 – 19 years, confirmed schooling in Lagos State, attendance at either private or public school in Lagos State and reading and writing effectively.

Ethics: This study employed participants for its inquiry. Due to this, research ethics for human participants were strictly adhered to, as stated by the Helsinki Declaration. The ethical requirements for scale development are exempted from the National Code of Health Research Ethics, Nigerian National Health Research Ethics Committee (NHREC). Section B, https://nhrec.net/nhrec/wp-content/uploads/2018/10/NCHRE_Aug_07.pdf

RESULTS

An exploratory factor analysis was conducted on the 45-item version of the scale to determine factor structure. Factors larger than one eigenvalue were retrieved during the first stage of EFA. Kaiser-Meyer-Olkin (KMO) measure of sample adequacy of .827 was within the suggestive range of 0 to 1. Bartlett's test of sphericity (BTS) was deemed

significant (X^2=4392.34, *df*= .990, *p*<.01). The results support the correlation matrix's factorability, and hence a principal component analysis (PCA) was conducted. The principal component extraction method test identified 14 factors extracted with eigenvalues > 1, and the summary is presented using the component matrix as the outcome confirmed the factorability of the correlation matrix. The summary of the principal component extraction method analysis showed 14 components extracted with eigenvalues > 1.5 (see Table 1).

Table 1 Eigenvalues and total variance explained.

	Initial eigenvalues		
Components	**Eigenvalues**	**% of Variance**	**Cumulative %**
1	8.557	19.015	19.015
2	3.102	6.893	25.907
3	1.958	4.351	30.259
4	1.878	4.173	34.432
5	1.597	3.548	37.980
6	1.470	3.267	41.248
7	1.455	3.233	44.480
8	1.364	3.030	47.511
9	1.257	2.793	50.304
10	1.207	2.682	52.986
11	1.122	2.493	55.479
12	1.117	2.482	57.961
13	1.054	2.342	60.303
14	1.027	2.283	62.586

Table 1 presents the principal component extraction analysis for the RUACEs 45-item. The extraction criteria (eigenvalues greater than one) produced 14 components whose eigenvalues were greater than one. As

tabulated above, the eigenvalues associated with each component represent the variation the specific component explains.

Component matrix of the 45-Item of the RUACES

The result of the component matrix indicates that the 45-item RUACEs loaded as follows: 18 items (Item 7, 9, 10, 11, 12, 13, 14, 15, 16, 30, 31, 32, 33, 34, 35, 36, 41 and 43) loaded on the first factor, 3 items (item 17, 18, 19) loaded on the second factor, 2 items (Item 3 and 4) loaded on the fourth factor, 2 items (Item 27 and 28) loaded on the eighth, 2 items (Item 25 and 38) are complex factors, 8 items (item 24, 37, 23, 45, 42, 20, 40 and 39) loaded on component 9, 10, 11, 12, 13, 3, 5 and 6 respectively each, while 10 items (item 1, 2, 5, 6, 8, 21, 22, 26, 29 and 44) loaded with a value less than the 0.40 cut-off point criterion for valid items inclusion. Therefore, these were dropped. The two items loaded on the fourth and eighth components were expunged since these were not substantial enough to assess the behaviour construct. Also, a critical examination of the two items loaded on the fourth and eighth components showed that they had been projected in component one. Due to this, only 21 items were retained (The component matrix tables are available upon request from the authors).

Reliability Coefficients of Redeemer's University Adverse Childhood Experiences Scale

The internal consistency of the RUACES and its subscales was established by calculating the Cronbach alpha (α) coefficient alpha as the reliability index. The internal consistency of the RUACES was satisfactory. The Cronbach α values of .867 were reported for the full scale, which showed a high-reliability coefficient. Also, all the items assessing RUACES .861 and .874 indicate that the items have very good discrimination and should be retained. Other measures of internal consistency of RUACES among the Nigerian sample revealed a Spearman-Brown coefficient of .809 and a Guttman Split-Half coefficient of .75, all indicating that the screening tool shows empirical evidence as a reliable measure of the construct of adverse childhood experiences.

Validity

RUACES was validated using the concurrent validity technique to ascertain its relationship with existing measures (related construct of adverse childhood experiences): The *Childhood Trauma Questionnaire* (CTQ; Bernstein & Fink, 1998) is a standardized, retrospective 28-item self-report inventory that measures the severity of different types of

childhood trauma, producing five clinical subscales each comprised of five items: Emotional Abuse, Physical Abuse, Sexual Abuse, Emotional Neglect, Physical Neglect. The measure also includes a three-item Minimization/Denial scale indicating the potential underreporting of maltreatment. Participants respond to each item in the context of "when you were growing up" and answer according to a five-point Likert scale ranging from "never" = 1 to "very often" = 5, producing scores of 5 to 25 for each trauma subscale. The test-retest consistency of the CTQ was studied by the creators in a clinical population (n=40), showing substantial test-retest reliability with retests conducted after 1.6-5.6 months (mean 3.6 months) and showing a high intraclass correlation of all subscales (R=.79–0.86; Bernstein & Fink, 1998).

The relationship between RUACES and CTQ was r=.367, p<.001). This result showed that RUACES is valid as a screening tool for use among the Nigerian population in assessing adverse childhood experiences.

RUACES was validated to ascertain its relationship with the *Benevolence Childhood Experiences* (BCEs; Narayan et al. 2018). BCEs is a 10-item checklist of favourable childhood experiences from birth to age 18, developed by Narayan et al. (2018) and scored in Yes/No responses. Items pertain to perceived internal and external safety and security (e.g., presence of beliefs that gave comfort, at least one safe caregiver), positive and predictive quality of life (e.g., enjoyment of school, predictable home routine), and relational support (e.g., a teacher who cared, a supportive non-caregiver adult). The BCEs have shown high test-retest reliability, r = .80, p < .01 (Narayan et al., 2018). Positively endorsed items were summed up for a total BCE score reflecting greater numbers of favourable experiences.

The relationship between RUACES and BCEs was (r=-.325, p<.001). This result showed that RUACES is valid as a screening tool for use among the Nigerian population in assessing adverse childhood experiences.

DISCUSSION

This study refines and confirms the utility of the *Redeemer's University Adverse Childhood Scale*. The scale assesses adverse childhood experiences in Nigerian settings and culture. Data analysis on the scale revealed that the measure is a bi-dimensional scale comprised of 21 items that measure physical abuse, emotional abuse, neglect and sexual abuse. However, other identified dimensions did not have sufficient items to predict adverse experiences in childhood. The scale differs from similar scales, such as the one developed by The World Health Organization called the *ACE International Questionnaire* (ACE-IQ; W.H.O, 2020). Previous scales have different dimensions measuring

adverse childhood experiences such as physical abuse, sexual abuse, emotional abuse, neglect, and family dysfunction, amongst other issues (Brown et al., 2009; Felitti et al., 1998), but the current scale had only two dimensions, which condensed all the items identified on the other dimensions into the two dimensions. The identified dimensions construct may be due to the geographical settings of the research participants and, most importantly, other scales assess adverse experiences in childhood after the individual has attained 18 years of age and above (Brown et al., 2009; Felitti et al., 1998; WHO, 2020). This current scale mainly focuses on adolescents who have experienced adversity or are currently experiencing adversity in their upbringing.

Limitations and suggestions for future research.

First, the scale is a self-report inventory, which could lead to bias in the item responses. The participants may underreport or overreport their adverse experiences. Further studies should consider involving parents or teachers in cross-examining what they have reported. Furthermore, the study was conducted in Nigeria, hence not a representative sample of children/adolescents in other regions or countries. Future research should consider conducting the study in other countries or across diverse cultures.

Conclusion

The RUACES was developed by extracting a 21-item 2-factor scale through the following processes: expert review (face and content validity) of the initial pool of items, item purification by EFA, and initial item production. The RUACES items' internal consistency, or reliability coefficient, was deemed adequate based on the present analysis. According to the study's findings, the 21-item RUACE had strong internal consistency and validity ratings to assess adverse experiences in adolescents. According to this investigation, the RUACES is valid and reliable for the Nigerian population. The scale can be self-administered individually and in group settings in schools and adolescent clinics to assess their prior or current adversity.

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APPENDIX A

The Redeemer's University Childhood Experiences Scale, the Benevelence Childhood Experiences Scale, and the Childhood Trauma Questionnaire are available upon request from the authors