

VALIDATION OF HOSPITAL ANXIETY AND DEPRESSION SCALE AMONG STROKE SURVIVORS IN NORTHWEST NIGERIA

***Aminu Saidu, Peace N. Ibeagha & John Eze**

Department of Psychology, University of Nigeria, Nsukka

***Correspondence:** +2348064860102, amnsidu@hotmail.co.uk

ARTICLE INFORMATION

Article history

Received 06 Oct. 2025

Revised 25 Nov. 2025

Accepted 26 Nov. 2025

Published Online 05 Dec. 2025

ABSTRACT

The Hospital Anxiety and Depression Scale (HADS) was initially developed to assess anxiety and depression in the medical outpatients' clinic. HADS has been variously validated among clients with different illness in various countries including Nigeria. This study contributes to clinical mental health counselling by investigating the use of HADs among outpatient stroke survivors in Northwest Nigeria. The cross-sectional survey design was used to select a total of fifty (50) stroke survivors (25 males, 25 females) that came for physiotherapy at the Murtala Muhammad Specialist Hospital, Kano. The respondents were aged between 25 and 65 years. Data analysis was conducted using Reliability analysis and Exploratory factor analysis (EFA) in SPSS (version 20). The results showed that the internal consistency reliability yielded a reliable Cronbach's alpha for the anxiety (HADS-A), and depression (HADS-D) subscales and a higher Cronbach's alpha for the total scale (HADS). This indicated that the subscales and the HADS total have adequate internal consistency. The EFA results indicated items loading above 0.40 and eigenvalues greater than one with scree plot illustrating two factors exactly before the bend. These verified the two-dimensional structure of HADS and its usefulness in assessing its constructs among outpatient stroke survivors. Therefore, the HADS is reliable and valid for use among stroke survivors in Northwest Nigeria.

Keywords: Anxiety, Depression, Factor analysis, EFA, HADS, Hospital, Northwest Nigeria, Reliability, Stroke survivors, Validation.

INTRODUCTION

Stroke Survivors are clients that had stroke and were treated in the hospitals, recovered, discharged and came back for follow up treatments in the neurological clinic, medical outpatients and physiotherapy departments. Stroke survivors experience anxiety and depression. The Hospital Anxiety and Depression Scale (HADS) was initially developed to investigate states of anxiety and depression among medical outpatients attending a hospital (Zigmond & Snaith, 1983). The objective of the HADS is to screen or assess anxiety and depression symptoms in the clients that are medically ill or all clients irrespective of the type of their illness (Julian, 2011; Smarr, 2003). The target population of HADS is general medical outpatients between the ages of 16 to 65 (Julian, 2011; Smarr, 2003) and clients experienced no problem in knowing the purpose of asking to answer the questions (Snaith, 2003).

In Nigeria, HADS was first validated in a certain teaching hospital's medical and surgical wards, antenatal clinic, gynaecology clinic and a community setting (Abiodun, 1994). However, the researcher did not specifically mention stroke survivors as being among the participants of the study, hence, the need for this study on the validation of HADS among stroke survivors.

The HADS has been used in various countries to assess anxiety and depression among stroke survivors. Ahmed et al., (2020) conducted a prospective study on the prevalence and predictors of post-stroke depression (PSD) and post-stroke-anxiety (PSA) during COVID-19 pandemic. The participants were 50 stroke patients (28 males, 22 females) on admission in two hospitals. They were prospectively assessed for PSD and PSA using HADS. The result indicated that among the 50 participants, clinically significant PSD was found in 36%, while PSA in 32%. The researchers concluded that the rise in PSD is related to stroke severity which has not changed significantly during the pandemic, however PSA showed a noticeable increase. It was found out that social deprivation and lack of rehabilitation were significantly related to the two.

Aljuhani et al. (2025) carried out a feasibility study on the rate of PSD and associated factors in single tertiary medical center. The participants of the study are 37 stroke patients aged 18-80 years with the aim of investigating the rate of PSD and the factors that influence it. The instruments used in the study were HADS and Short-Form Health Survey (SF-36). The result showed that the frequency of anxiety and depression was 59.5% at admission but decreased to 40.5% at discharge from rehabilitation therapies. The researchers concluded that there was a high rate of depression and anxiety among inpatient stroke patients but rehabilitation therapies can lead to the decrease of depression and anxiety among stroke patients from initial admission to discharge.

Diamond, Dysch, & Daniels (2023) conducted a cross-sectional study on the prevalence of health anxiety in stroke survivors and its impacts on quality of life. The participants of the study comprised of 105 stroke survivors that were sampled through online stroke community forums. The instruments used were HADS and Short Health Anxiety Inventory (SHAI). The results indicated that 36% of the participants scored above the clinical cut off for health anxiety and stroke survivors with high health anxiety (HiHA) were found to have significantly lower quality of life and higher rates of depression. The researchers concluded that almost a third of stroke survivors experienced clinical stages of health anxiety with HiHA significantly related to lower quality of life.

Eticha et al. (2024) carried out a prospective multicenter study on the higher burden of PSD and PSA and their predictors among stroke survivors. The participants were 404 stroke survivors from five comprehensive specialized hospitals. Anxiety was operationally defined as a total subscale score of ≥ 8 points out of a possible 21 points in the anxiety subscale of HADS (HADS-A). Depression was operationally defined as a total depression subscale score of ≥ 10 points out of a possible 21 points in the Patient Health Questionnaire-9 (PHQ-9). The results showed that the prevalence of post-stroke depression and anxiety among stroke survivors was 64.1% (95% CI: 59.3–68.6%) and 45.5% (95% CI: 40.7–50.4) respectively. The researchers concluded that relatively higher burdens of post-stroke depression and anxiety were observed among stroke survivors and early mental health screening and diagnosis of old age, complicated case patients, and retired stroke survivors are required for early-stage interventions.

Karlsson, Hammarstrom, Fogelkvist and Lundqvist (2024) carried out a study on the psychometric characteristics of HADS in stroke survivors of working age before and after inpatient rehabilitation. Patients registered in nine rehabilitation centers between 18 and 66 years of age who had answered the HADS at admission ($n=256$), and/or at discharge ($n=223$), and /or 1 year follow up ($n=313$) were included. Patients registered during the same period who had not answered the HADS were used for comparison with the above three study cohorts. The results showed that the two-factor HADS items measuring anxiety and depression showed better fit than a single factor measuring emotional distress. Also, the HADS psychometric stability before and after rehabilitation was satisfactory. Cronbach's alpha coefficients showed satisfactory internal consistency reliability. The researchers concluded that HADS showed a stable two-factor structure over the rehabilitation period. Patients' interpretation of items was not affected by the recovery, allowing relevant comparison of HADS scores between different stages of the rehabilitation process. Generally, despite minor psychometric weaknesses, HADS is a suitable instrument for assessing anxiety and depression symptoms in stroke patients aged 18-66 years in this country. However, studies to verify the suitability of HADS for post-stroke clients in Nigeria using reliability analysis or and exploratory factor analysis were not found during our search, hence the need for the present study.

Reliability analysis (RA)

Izah, Sylva & Hait, (2024) described reliability analysis (RA) as a vital statistical procedure used to assess the consistency, stability, and dependability of datasets and measurement methods. The major use of RA is to determine whether the measurements or data are reliable enough to draw conclusions or make decisions with confidence. A test or scale is reliable when it consistently measures the construct that it was intended to measure which implies producing stable consistent results (Carmines & Zeller, 1979). Testing for reliability is important as it refers to the consistency across the parts of a measuring instrument (Huck, 2007). Internal consistency is a type of reliability test that measures consistency within the instrument (i.e. consistency among the items) (Izah et al., 2024). Internal consistency is commonly used to show how a set of items or questions consistently measure the same underlying concept. There are many internal consistency reliability methods. One of the methods that measures consistency within the instrument is Cronbach's alpha (Izah et al., 2024; Numiqo, 2025a). Cronbach's alpha is frequently used to measure the internal consistency of questionnaires in a likert scale format and most researchers agree that internal consistency coefficient of Cronbach's alpha 0.70 or higher is reliable and acceptable (Izah et al. 2024; Garth, 2008).

Exploratory Factorial Analysis (EFA)

On the other hand, EFA is a technique that aims to reproduce the observed relationships items of a scale with subscales, because there is possibility of correlations between the items and these correlations are the basis of factor analysis (Numiqo Team, 2025b). Factor analysis techniques help to reveal the underlying constructs that give rise to observed phenomena thereby validating them for specific use.

Construct validity refers to the extent to which a psychological test or scale measures the theoretical concept or psychological construct that it purports to measure (Nickerson, 2024). Construct validity has two components convergent and discriminant validity (Bhandari, 2022; Nickerson, 2024). Convergent validity refers to the degree to which two concepts or constructs that should be related theoretically, are in fact related. It is shown when a validity test correlates positively with measures of similar or related constructs (Nickerson, 2024). Meanwhile, discriminant validity refers to the extent to which a concept or construct differs from another. Bhandari (2022) pointed out that discriminant validity means that two measures of unrelated constructs that should be unrelated, very weakly related, or negatively related practically shows it. Nickerson (2024) stated that discriminant validity is exhibited when the test shows weak or no correlations with measures of unrelated constructs, ensuring that it is not measuring something else entirely.

For the purpose of verifying construct validity (discriminant and convergent validity), factor analysis can be done using principal component analysis (PCA) with varimax rotation method (Koh & Nam, 2005; Wee & Quazi, 2005) and this technique was applied in this study to validate the HADS for outpatient stroke survivors. And variables with factor loadings higher than 0.30 were considered as valid as this shows a high correlation between observed variables and the factors specified. The factor analysis results satisfy the criteria of construct validity including both the discriminant validity (loading of at least 0.40) and convergent validity (eigenvalues of 1) (Boudreau, Gefen & Straub, 2001; Straub, Boudreau, & Gefen, 2004).

Numiqo Team (2025b) reported that to establish the number of factors, with the help of the eigenvalue criterion, the eigenvalues of the different factors are needed and when these are analyzed, all factors with eigenvalues greater than 1 are used. Furthermore, to establish the number of factors with the help of the scree plot, the eigenvalues are arranged by size and represented by a line chart. Where there is a bend in the chart, the number of factors can be read (Numiqo Team, 2025). Hence, the eigenvalues and scree plots serve as a guide in determining how many factors are the best fit in the data.

Consequently, the present research aims to test the internal consistency reliability and the Cronbach's alpha yield of the anxiety subscale (HADS-A), depression subscale (HADS-D), and the total HADS. The study also aims to determine if the two subscales of HADS (i.e., anxiety and depression) are appropriate and applicable for measuring hospital-related anxiety and depression among outpatient stroke clients in Nigeria. By gathering data to explore the number of factors and factor loading of the indicators via exploratory factor analysis to ensure the number of factors and validity of the HADS for stroke outpatients in Nigeria.

METHOD

Participants

Fifty (50) stroke survivors (participants) diagnosed of ischaemic and haemorrhagic stroke that comprised of 25 males and 25 females within the age range of 25 years to 65 years that came for physiotherapy in the Physiotherapy Department of Murtala Muhammad Specialist Hospital, Kano were selected by convenience sampling for the study. The inclusive criteria are stroke survivors that were treated, became stable, discharged and came back for follow up medical treatments and/or physiotherapy. The exclusive criteria are stroke survivors with prior history of anxiety and depression, stroke survivors with psychotic disorders, dementia, transient ischaemic attack (TIA), parkinson's disease, acute illness, aphasia, dysarthria, other communication disorders, and the very aged were excluded from this study. Also, stroke survivors that are mentally deranged, incoherent, abuse drug (s) were excluded from the study. The researcher was assisted in identifying stroke survivors that were excluded from the study by the physiotherapists working in the physiotherapy department. The file records of the stroke survivors were also a reference for the exclusion of some of the stroke survivors. Also, behavioural and physical observations were used by the researcher to exclude stroke survivors that were in the categories of the exclusion. Furthermore, some relatives of the stroke survivors or care givers provide past medical/mental history of the stroke survivors that assisted in the exclusion.

Instrument

The instrument used for this study was the Hospital Anxiety and Depression Scale (HADS) originally developed by Zigmond and Snaith to investigate states of anxiety and depression among medical outpatients attending hospital (Zigmond & Snaith, 1983). HADS is a 14-item scale and consists of 7 items each for anxiety and depression symptoms in the anxiety and depression scales (HADS-A and HADS-D) (Zigmond & Snaith, 1983). The HADS is a paper and pencil individually administered questionnaire (Julian, 2011; Smarr, 2003) but can also be administered by an interviewer (Julian, 2011). For stroke survivors with low education or problems with sight, the itemized questions can be read and explained to them (Snaith, 2003). Bodily (physical) symptoms associated with emotional disorders were excluded from the HADS (Smarr, 2003). Bodily (physical) symptoms such as loss of appetite, would add to the overall score derived from completion (Snaith, 2003). The HADS-A subscale is composed of those items that measure generalized anxiety which includes, tension, worry, fear, panic, difficulties in relaxing and restlessness (Julian, 2011). The HADS-A items focus on cognitive and emotional symptoms. For example, item 1 of HADS-A stated that, "I feel tense or 'wound up'" (Smarr, 2003). The HADS-D items focus predominantly on anhedonia (Smarr, 2003). For example, item 1 stated that, "I still enjoy the things I used to enjoy". The patient self-reports is assessed on a four-point likert scale based on an interval score of 0-3 (Snaith, 2003). The HADS can be completed in five or fewer than five minutes (Greater Manchester & Cheshire Cardiac and Stroke Network, 2011; Julian, 2011; Snaith, 2003). The total score range for HADS-A and HADS-D is 0-42, and this means 0-21 for HADS-A, and 0-21 for HADS-D (Julian, 2011; Smarr, 2003; Snaith, 2003). Zigmond and Snaith (1983) established the score interpretations of HADS-A and HADS-D subscales as follows; 0-7 normal (non-case), 8-10 borderline abnormal (possible case), and 11-21 abnormal (probable case). A review of many studies indicated a cutoff score of 8/21 for anxiety or depression (Bjelland, Dahl, Hang & Neckelmann, 2002). The study conducted in

Nigeria indicated that the optimum cutoff score for the HADS-A and HADS-D subscales is 8 (Abiodun, 1994). These imply that clients with the cutoff score of 8 and above in one of the subscales or in both anxiety and depression subscales indicate anxiety symptoms and/or depressive symptoms (Yusif, Maitama, Amedu, Ahmed, & Mbibu, 2012).

For used in this study, the translation of HADS into Hausa Language based on the method of back translation was done with specialists in the Department of Nigerian Languages, Bayero University, Kano because of the participants who are unable to read or understand English Language.

Procedure

Approval for this study was obtained from the ethical committee of the Ministry of Health, Kano. The ethical rules instructed by the ethical committee were abided in the study which includes informed consent, confidentiality and right to conservation of time. Trained research assistants were involved in administering the test. The researcher and his assistants got the informed consent of the individual stroke survivors and assure them of confidentiality before administering the HADS. The HADS was administered to the individual stroke survivors before the start of Physiotherapy in the Department of Physiotherapy. However, for stroke survivors that were not literate, the questions in the HADS were read out and explained to them individually by the researcher or research assistants and their responses ticked. Finally, the researcher and/or his assistants thanked each participant for his/her participation in the research and wished that he/she got better.

Design/Statistics

The design of the study was cross sectional survey due to hospital treatment schedules for the stroke survivors and time constraints for the research. The statistics used were reliability analysis (RA) and exploratory factor analysis (EFA). The scores of each participant were entered into the Statistical Package for Social Sciences (SPSS) Version 20 and analyzed.

RESULTS

Table 1: HADS-A Mean, Standard deviation, Intercorrelations and Cronbach's Alpha

N (50)	No. of Items (7)	Mean	Standard Deviation	Cronbach's Alpha (Unstandardized)	Cronbach's Alpha (Standardized)
50	1	2.8200	.48192		
50	2	2.4600	.50346		
50	3	2.6000	.57143		
50	4	2.4800	.57994		
50	5	2.3400	.68839		
50	6	2.8400	.37033		
50	7	2.2400	.62466		
				.732	.719

Table 1 results showed that the internal consistency reliability yielded a Cronbach's alpha of .732 for the anxiety subscale (HADS-A).

Table 2: HADS-D Mean, Standard deviation and Cronbach's Alpha

N (50)	Number of Items (7)	Mean	Standard Deviation	Cronbach's Alpha (Unstandardized)	Cronbach's Alpha (Standardized)
50	1	2.6200	.56749		
50	2	2.3800	.53031		
50	3	2.4200	.64175		
50	4	2.3200	.62073		
50	5	2.1200	.59385		
50	6	2.1200	.52060		
50	7	2.2000	.53452		
				.737	.741

Table 2 results indicated that the internal consistency reliability yielded a Cronbach's alpha of .737 for the depression subscale (HADS-D).

Table 3: HADS Mean, Standard deviation and Cronbach's Alpha

N (50)	No. of Items (14)	Mean	Standard Deviation	Cronbach's Alpha (Unstandardized)	Cronbach's Alpha (Standardized)
50	1	2.8200	.48192		
50	2	2.4600	.50346		
50	3	2.6000	.57143		
50	4	2.4800	.57994		
50	5	2.3400	.68839		
50	6	2.8400	.37033		
50	7	2.2400	.62466		
50	8	2.6200	.56749		
50	9	2.3600	.52528		
50	10	2.4200	.64175		
50	11	2.3000	.61445		
50	12	2.1200	.59385		
50	13	2.1200	.52060		
50	14	2.1800	.52255		
				.835	.828

Table 3 results showed that the internal consistency reliability yielded a Cronbach's alpha .835 for the total HADS scale.

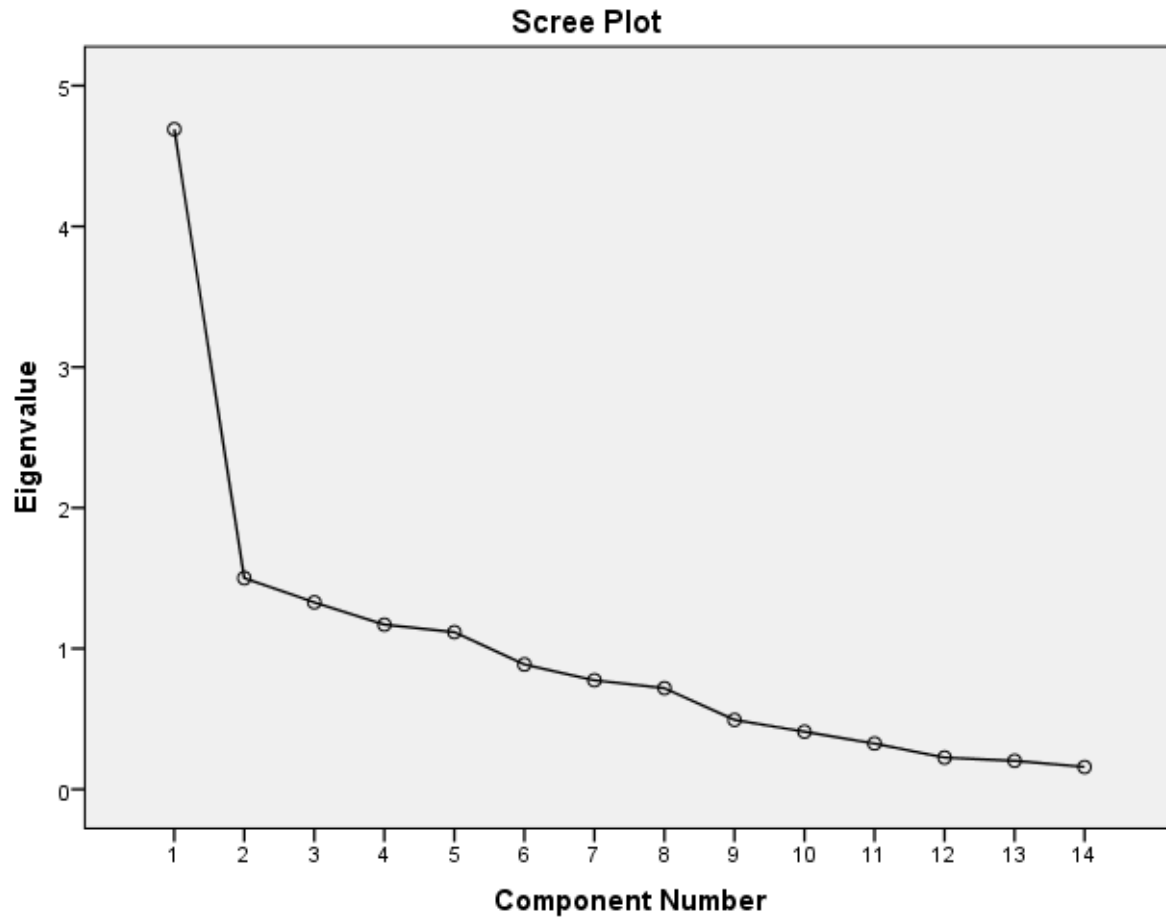


Figure 1: shows the results of exploratory factor analysis (construct validity) with items loading 0.40 to above and eigenvalue greater than one and scree plot of 2 or 3 factors.

Table 4: Factors Loading of the Items in the Subscales

No. of Items	HADS Items	Items loading	Eigenvalues	Variance Explained
A 1.	I feel tense ‘wound up’:	0.743	4.690	33.502
D 2.	I still enjoy the things I used to enjoy:	0.755	1.500	10.717
A 3.	I get a sort of frightened feeling as if something awful is about to happen:	0.612		
D 4.	I can laugh and see the funny side of things:	0.605		
A 5.	Worrying thoughts go through my mind:	0.694		
D 6.	I feel cheerful:	0.866		
A 7.	I can sit at ease and feel relaxed:	0.730		
D 8.	I feel as if I am slowed down:	0.841		
A 9.	I get a sort of frightened feeling like ‘butterflies’ in the stomach:	0.722		
D 10.	I have lost interest in my appearance:	0.501		
A 11.	I feel restless as I have to be on the move:	0.708		
D 12.	I look forward with enjoyment to things:	0.495		
A 13.	I get sudden feelings of panic:	0.361		
D 14.	I can enjoy a good book or radio or TV program:	0.825		

Table 4 shows the factor loadings after rotated component matrix

DISCUSSION

The first finding of the study showed that the internal consistency reliability yielded a Cronbach’s alpha of .732 for the anxiety subscale. The second finding of the study indicated that the internal consistency reliability yielded a Cronbach’s alpha .737 for the depression subscale (HADS-D). A reliability of .70 indicates 70% consistency in the scores that are produced by an instrument (University of Connecticut, 2013). Therefore, a Cronbach's alpha of .70 and above is considered acceptable as a reliable instrument (Garth, 2008; Izah, et al., 2024; Hinton, Brownlow, Murray, & Cozens, 2004; Numiqo, 2025a; University of Connecticut, 2013). A reliable instrument is also a valid one (University of Connecticut, 2013). Therefore, the first and second findings of this study indicated that HADS-A and HADS-D have good internal consistency and are reliable and valid measures of anxiety and depression in stroke survivors.

Abiodun (1994) reported that the sensitivity of HADS-A was in the interval of 85.0% to 92.9% and the specificity was in the interval of 86.5% to 90.6%. Furthermore, the sensitivity for HADS-D was in the interval of 89.5% to 92.1% and the specificity ranged from 86.6% to 91.1% (Abiodun, 1994). Sensitivity and specificity are two measures typically used in clinical setting (healthcare) to determine the validity of a test (Eldridge, 2025). Sensitivity is a measure of how well a given test identifies the illness or trait in question (i.e., avoids false negatives results) (Eldridge, 2025). Specificity is a measure of how well a given test identifies the absence of the condition being tested (i.e., avoids false positives results) (Eldridge, 2025). Combined, these two measures are vital for determining the predictive value of a test and how well it will perform in clinical settings (Eldridge, 2025). Furthermore, Sensitivity is the ability of a test to correctly identify clients with the illness (true positives), minimizing false negative results (West, Kobokovich, 2020). Specificity is its ability to correctly identify those without the disease (true negatives), minimizing false positive results (West & Kobokovich, 2020).

It is important that a stroke emotion screening instrument is sensitive and specific (Greater Manchester & Cheshire Cardiac and Stroke Network, 2011). Sensitive means that the instrument identifies most clients who are experiencing emotional problems. Specific means that the instrument does not categorize clients who are not experiencing a problem as having one (Greater Manchester & Cheshire Cardiac and Stroke Network, 2011). An instrument is considered sensitive and specific if it had demonstrated to have a sensitivity of 80% or higher and a specificity of 60% or higher (Greater Manchester & Cheshire Cardiac and Stroke Network, 2011). These imply that in ten clients with emotional problems, eight or more would be identified using the instrument (establishing sensitivity) and in ten clients without emotional problems, four or less would be identified as having an emotional problem (specificity) (Greater Manchester & Cheshire Cardiac and Stroke Network, 2011).

The third finding of this study indicated that the internal consistency reliability estimates or Cronbach's alpha for the total scale (HADS) was .835. These indicated that the subscales and the HADS as a whole have a good internal consistency (Garth, 2008; Izah et al., 2024; Numiqo, 2025a). The combined Cronbach's alpha of HADS-A and HADS-D was investigated because the aim of HADS is to evaluate anxiety and depression in medically ill clients or all clients irrespective of the type of their illness (Julian, 2011; Smarr, 2003).

The fourth finding of this study was of the exploratory factor analysis that was done for the purpose of verifying the construct validity (discriminant and convergent validity). This is because the initial constructors of HADS have already done the content analysis including the confirmatory factor analysis (Zigmond & Snaith, 1983). Physical symptoms associated with emotional disorders were excluded from the HADS (Smarr, 2003). This is because physical symptoms such as loss of appetite, would add to the overall score derived from completion (Snaith, 2003). The HADS-A is comprised of items that measure generalized anxiety (Julian, 2011). Also, the HADS-A items emphasized on cognitive and emotional symptoms (Smarr, 2003). The HADS-D items centered on anhedonia (Smarr, 2003).

The exploratory factor analysis in this study was conducted using principal component analysis with varimax rotation. The results indicated items loading above 0.40. The findings also indicated eigenvalues greater than one and the scree plot illustrates 2 to 3 factors exactly before the bend (Figure 1). These verified the two-dimensional structure of HADS and its usefulness in assessing the constructs of this study among the stroke survivors (Columbia University, 2025; Koh & Nam, 2005; Numiqo Team, 2025a; Straub et al., 2004; Wee & Quazi, 2005). The internal consistency reliability of HADS as analyzed by these researchers serves as evidence of its construct validity. Proof of the construct validity of HADS has previously also been established (Abiodun, 1994).

Implications of the Findings

The implications of the findings for clinical practice was that specialized and professional psychologists such as clinical, counselling and developmental psychologists that are working with stroke survivors in Nigerian hospitals should use HADS in assessing anxiety and depression in stroke survivors. This will help in giving holistic management to the stroke survivors because they will also benefit from psychological management instead of only the physical management that is now the mainstay of treatment.

Conclusion

The above results and findings of this study indicated that the HADS is reliable and valid for use among stroke survivors in Nigeria.

Recommendations

The HADS should be adapted for used in screening hypertensive, diabetic, HIV, and palliative clients by the clinical, counselling and developmental psychologists working in the multidisciplinary team of healthcare professionals to assess anxiety and depression with the view of providing psychological management to the clients that were found to have anxiety and/or depression.

REFERENCES

- Abiodun, O. A. (1994). A validity study of the hospital anxiety and depression scale in general hospital units and a community sample in Nigeria. *British Journal of Psychiatry*, 165(5), 669-672.
- Ahmed, Z. M., Khalil, M. F., Kohail, A. M., Eldesouky, I. F., Elkady, A., & Shuaib, A. (2020). The prevalence and predictors of post-stroke depression and anxiety during COVID-19 pandemic. *Journal of Stroke and Cerebrovascular Diseases*, 29(12), 105315. doi:10.1016/j.jstrokecerebrovasdis.2020.105315.
- Aljuhani, T., Alsubie, S., Al-Mutairi, A. M., Altheyab, A. S., Alsahali, A. M., Alhamdan, A. S., Alqahtani, F. M., Olayan, L. H., & Senitan, M. (2025). Rate of post-stroke depression associated factors in Saudi single tertiary medical center. *Journal of Multidisciplinary Healthcare*, 18, 5421-5430. https://doi.org/10.2147/j/WDH.S542551.
- Bjelland, I., Dahl, A. A., Haug, T. T., & Neckelmann, D. (2002). The validity of the hospital anxiety and depression scale: An updated literature review. *Journal of Psychosomatic Research*, 52(2), 69-77. https://doi.org/10.1016/S002-3999(01)00296-3
- Boudreau, M., Gefen, D. & Straub, D. 2001. Validation in information systems research: A state-of-the-art assessment. *Management Information Systems Quarterly*, 25(1), 1-16.
- Carmines, E. G., & Zeller, R. A. (1979). *Reliability and validity assessment*. SAGE.
- Diamond, P. R., Dysch, L., Daniels, J. (2023). Health anxiety in stroke: A cross sectional study on the prevalence of health anxiety in stroke survivors and the impact on quality of life. *Disability and Rehabilitation*, 45(1), 27-33. https://doi.org/10.10/09638288.2021.2022778
- Eldridge, S. (2025). *Sensitivity and specificity*. Retrieved from https://www.britannica.com/science/sensitivity-medical-statistics
- E Scholarly Community Encyclopedia. (2025). *Validity and reliability of the research instrument*. Retrieved from https://www.encyclopedia.pub/entry/20511
- Eticha, B. C., Yalew, E. S., Merawie, D. M., Chanie, S. T., Demissie, K. A., Eticha, B. L., (2024). A higher burden of post-stroke depression and anxiety and their predictors among stroke survivors in the Amhara regional state of Ethiopia in 2024: A prospective multicenter study. *Front Psychiatry*, 16:1545807. doi:10.3389/fpsy.2025.1545807
- Fornell, C., & Larcker, D. F. (1981). Structural equation models with unobservable variables and measurement error: Algebra and statistics. *Journal of Marketing Research*, 18(3), 382-388. https://doi.org/10.2307/3150980
- Garth, A. (2008). *Analysing data using spss*. Retrieved from https://www.students.shu.ac.uk/lits/it/documents/pdf/analyzing_data_using_spss.pdf
- Greater Manchester., & Cheshire Cardiac and Stroke Network. (2011). *G-Master, Greater Manchester assessment of stroke rehabilitation, mood screening tools recommendations*. Retrieved from https://www.system.improvementnhs.uk/improvementSystem/ViewDocument.aspx?path=Cardiac/National/Website/Stroke/Psychologicalsupport/resource/MoodtoolselectioninfoFINAL.pdf

- Hinton, P. R., Brownlow, C., McMurray, I., & Cozens, B. (2004). *SPSS explained*. Routledge Inc.
- Huck, S. W. (2007). *Reading Statistics and Research*. Allyn & Bacon.
- Izah, S. C., Sylva, L., & Hait, M., Cronbach's alpha: A cornerstone in ensuring reliability and validity in environmental health assessment. *E S Energy & Environment*, 23, 1057 doi:<https://dx.doi.org/10.30919/esee.1057>
- Julian, L. J. (2011). Measures of anxiety. *Arthritis Care Research Journal*.doi: 101002/acr.20561
- Karlsson, J., Hammarstrom, E., Fogelkvist, M., & Lundqvist, L-O. (2024). Psychometric characteristics of the hospital anxiety and depression scale in stroke survivors of working age before and after inpatient rehabilitation. *PLos ONE*, 19(8):e0306754 .<https://doi.org/10.1371/journal.pone.0306754>
- Koh, C. E. & Nam, K. T. (2005). Business use of the internet: A longitudinal study from a value chain perspective. *Industrial Management & Data Systems*, 105, 85-95.
- Nickerson, C. (2025). *Construct validity in psychology research*. Retrieved from <https://www.simplypsychology.org/construct-validity-definition-examples.html>
- Numiqo Team. (2025a). *Cronbach's alpha*. Retrieved from [https://www.numiqo.com/tutorial/cronbach's alpha](https://www.numiqo.com/tutorial/cronbach's%20alpha)
- Numiqo Team. (2025b). *Exploratory factor analysis*. Retrieved from <https://www.numiqo.com/tutorial/exploratory-factor-analysis>
- Piedmont, R. L. (2014). *Eigenvalues*. Retrieved from <https://www.link.springer.com/rwe/10.1007/978-94-007-0753-5-851>
- Ratliff, K. (2020). *How to interpret sensitivity and specificity*. Retrieved from <https://www.https://www.wpspublish.com/blog/understanding-sensitivity-and-specificity-casl-2>
- Smarr, K. L. (2003). Measures of depression and depressive symptoms. *Arthritis Care and Research Journal*, 49(5), 134-146. <https://doi.org/10.1002/art.11410>
- Snaith, R. P. (2003). *The hospital anxiety and depression scale*. doi: 10.1186/1477-7525-1-29
- Straub, D., Boudreau, M-C., Gefen, D. (2004). Validation guidelines for IS positivist research. *Communications of the Association for Information Systems*, 13, 380-427. <https://doi.org/10.17705/1CAIS.01324>
- University of Columbia. (2025). *Exploratory factor analysis*. Retrieved from [https://www.publichealth.columbia.edu/research/population-health-methods/exploratory-factor analysis](https://www.publichealth.columbia.edu/research/population-health-methods/exploratory-factor-analysis)
- University of Connecticut. (2013). *Instrument reliability*. Retrieved from https://www.researchbasics.education.uconn.edu/instruments_reliabilty/
- Wee, S. W., & Quazi, H. A. (2005). Development and validation of critical factors of environmental management. *Industrial Management and Data Systems*, 105(1), 96-114. doi:10.1108/02635570510575216
- West, R., & Kobokovich, A. (2020). *Understanding the accuracy of diagnostic and serology tests: Sensitivity and specificity*. The Johns Hopkins University. Retrieved from <https://www.centerforhealthsecurity.org/sites/default/files/2022-11/201207-sensitivity-specificity-factsheet.pdf>
- Yusif, A. J, Maitama, H. J., Amedu, M. A., Ahmed, M. A., Ahmed, M., & Mbibu, H. N. (2012). Socio-demographic correlates of psychological distress among male patients with infertility in Zaria, Nigeria. *African Journal of Urology*, 18(4), 170-174.

Zigmond, A. S., & Snaith, R. P. (1983). The hospital anxiety and depression scale.
Acta Psychiatrica Scandinavica, 67(6), 36.