Stability (test-retest) reliability, concurrent, convergent and divergent validity of the Igbo version of participation scale (I-Pscale) among people living with Hansen's disease in South-east Nigeria

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Summary

Objective: The Participation Scale is a researcher administered generic outcome instrument developed to measure participation restrictions. It addresses the ICF domains of community, social and civic life, mobility, major life domains, domestic life, learning and applying knowledge, self-care, and social interactions. It is designed as a generic, client-reported, and cross-culturally relevant measure of participation that is suitable for non-professional interviewers. The aim of this study was to determine the construct (convergent and divergent) validity, criterion (concurrent) validity, and stability (test-retest) reliability of the Igbo version of P-scale in order to enhance its use in the Igbo speaking population.

Design: This cross sectional survey involved 60 participants (39 males and 21 females) affected by Hansen's disease in South-Eastern region of Nigeria, with mean age of $49 \cdot 8 \pm 12 \cdot 8$ years. Test-retest reliability was analysed with intraclass correlation coefficient (ICC) and the Bland and Altman method. Construct validity and Criterion validity was investigated with the Spearman rank correlation coefficient. Mann-Whitney U test was used to compare the difference between the sum score of the I-Pscale (Igbo version) and E-Pscale (English version).

Result: Test-retest reliability was high (ICC $= 0 \cdot 98 - 0 \cdot 99$; $P = 0 \cdot 001$). There was a significant correlation ($r = 0 \cdot 99$; $P = 0 \cdot 001$) between the scores obtained on English and Igbo versions of P-scale indicating good concurrent validity. There was no significant difference between the sums of the Igbo and English versions of the P-scale score ($U = 1799 \cdot 00$; $P = 0 \cdot 99$), suggesting excellent concurrent validity. There was also a significant correlation between the scores of the IP-scale and the Keele Assessment of Participation scores ($r = 0 \cdot 806$; $P = 0 \cdot 001$). A significant correlation

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was also found between the IP-scale score and Falls Efficacy Scale score ($r = 0.290$; $P = 0.024$) signifying a poor divergent validity. Alpha level was set at 0.05.
Conclusion: The Igbo version of the P-scale is a valid and reliable outcome measure for those affected by Hansen's disease in South-Eastern, Nigeria.

Keywords: Participation scale, Psychometric properties and Hansen's disease

Introduction

Hansen's disease (leprosy) is a chronic infectious disease caused by Mycobacterium leprae.[1] Although contagious, its morbidity is low because a large portion of the population is naturally resistant to this disease. The main route of transmission is the nasal mucosa.[2] Less commonly, transmission can occur by skin erosions.[3] Hansen's disease (HD) affects mainly the skin and peripheral nerves which results in weak and anesthetic hands and feet, as well as in blindness and facial disfigurement.[4] Its diagnosis is established based on skin and neurologic examination of the patient. Early diagnosis is very important as the timely and proper implementation of treatment will prevent sequelae of physical disabilities that have an impact on an individuals' social and working life.[5]

Hansen's disease is endemic in tropical countries, especially in underdeveloped and developing countries.[6] It is endemic in several tropical countries today, often in those with differential development or extreme wealth disparities Worldwide, two million people are estimated to be disabled by the consequences of HD. Its prevalence has decreased markedly since the introduction of multidrug therapy (MDT) in the beginning of the 1980s. However, 105 endemic countries, specifically located in Southeast Asia, in the Americas, Africa, Eastern Pacific and Western Mediterranean, still concentrate a large number of cases. In the first quarter of 2012, 181,941 new cases were recorded and there was a prevalence of 0.34 cases per 10,000 inhabitants.[6]

Hansen's disease is an important cause of preventable disability.[1] Disability are changes that limit daily activities or social life of a normal individual according to age, socioeconomics and education.[7] Physical impairments associated with HD is usually secondary to nerve damage resulting from the chronic granulomatous inflammation due to *Mycobacterium leprae*.[8] Impairments may give rise to disabilities, such as limitations of activities involving the use of hands, feet and eyes, and restrictions in social participation. In addition to physical impairments and activity restrictions, PLD are likely to suffer from social stigma and discrimination leading to economic loss and social participation restrictions.[9]

The study of disabilities in Hansen's disease is considered a functional limitation, activity limitation and social participation restrictions and these limitations are measured by scales such as P-scale.[10] Several instruments have been developed to assess participation restrictions especially in people with health conditions.[11] However, these instruments have been developed for use with people living in developed countries, have been disease specific or have covered only some certain aspects of 'participation'. The Participation Scale has been designed to measure participation restrictions in people living with leprosy, disability and other stigmatised conditions based on the International Classification of functioning, Disability and Health (ICF) as much as possible and culture free.[12]

The Participation scale is the result of an international research programme dedicated to develop tools for assessment, monitoring and evaluation in rehabilitation.[13,14] The

information from this scale can be used by all health professionals in the care of their patients and to make decisions from the most current evidence as regards to evidence based medicine.[15] Also this information will go a long way in disability reduction and improvement of participation for individuals with disabilities which is an important goal of rehabilitation.[16]

The Participation Scale is an 18-item instrument used to measure how respondents rate their participation in comparison with a 'peer', defined as 'someone similar to the respondent in all aspects except for the disease or disability'.[17] It allows quantification of participation restrictions experienced by people affected by leprosy, disability or other stigmatised conditions. Various instruments based on the ICF that intend to measure social participation, cover six to eight of the nine domains ICF, as published by the WHO in 2001.[18] The P-scale covers eight out of nine domains. The instrument measures perceived participation restriction and intends to be generic in nature.[19] The cross-cultural validity of the scale was ensured by developing the scale with an international team of experts, from three countries and six different languages.[19] The Participation scale was found to be valid and reliable with a Cronbach's alpha of 0·92, a test-retest reliability ICC of 0·83 and inter-tester reliability of 0·80.[17] It has also been shown to have a satisfactory reproducibility in a study by Carlijn *et al.*[20]

The Igbo version of the participation scale was translated by a team of researchers led by Dr. Peter O. Ibikunle.[21] Reliability analysis conducted using the Cronbach Alpha reliability test revealed that the overall reliability Alpha of the scale is 0·91 which were equal to those of other versions.[22]

Hansen's disease has high global prevalence and is highly endemic in tropical nations with associated high physical, psychological, social and economic burden.[23] People with disabling conditions such as Hansen's disease are often constrained in their performance of daily activities and in their social interactions and participations.[17] Participation restriction is frequently measured among individuals with health conditions that might cause disability and stigmatisation, and consequently, several instruments have been developed for the assessment of participation restriction in such people.[11] However, most of the instruments were developed and validated in developed countries and others developed and validated in developing countries were mainly done in the English language. The P-Scale is one of such scales. Therefore, to ensure cultural and environmental suitability, the P-Scale has been translated and validated in other languages including the Igbo, one of the three major ethnic groups in Nigeria.[21] The structural validity and internal consistency of the Igbo version of participation scale, has been measured using the factor analysis and the Cronbach Alpha's test reliability. This study therefore aimed to determine the concurrent, convergent and divergent validity and the stability (test-retest) reliability of the Igbo version of Participation Scale (I-Pscale) among Igbos affected by Hansen's disease in south-eastern Nigeria.

The outcome of this study has established a psychometrically sound Igbo version of the Participation Scale available for assessing the extent of participation restrictions among Igbo monolinguals in Nigeria who are affected by Hansen's disease, disabilities and other stigmatised conditions in Igbo speaking areas.

Materials and Methods

This study was a cross sectional survey designed to determine the concurrent, convergent, divergent and test-retest reliability of the Igbo version of Participation scale.

The population of the study comprised of all volunteering individuals with Hansen's disease who met the requirements of the inclusion criteria for participation in the study and were sourced from conveniently sampled Leprosy Centres in South-eastern, Nigeria, which included:

- Oji Leprosy Settlement Oji, Enugu State,
- Uzuakoli Leprosy Settlement, Uzuakoli, Abia State,
- Okija Leprosy Settlement, Okija, Anambra State.

Consecutive sampling technique was employed in this study. All the people that satisfied the requirements of the inclusion criteria were recruited, since the population was limited. Sixty people living with Hansen's diseases participated in this study.

INCLUSION CRITERIA

The participants of the study included males and females who:

1. Were from 18 years and above who reside in the aforementioned centers and are willing to participate.
2. Had some degree of leprosy-related impairments and are well oriented in time, place and person.
3. Could read, speak and understand Igbo and English language.

EXCLUSION CRITERIA

1. Individuals with Hansen's disease who were not well oriented in time, place and person.
2. Individuals with Hansen's disease who had communication impairment.

RESEARCH INSTRUMENTS

1) ***The English version of Participation scale (E-Pscale):*** used to determine the concurrent validity.
2) ***The Igbo version of Participation scale (I-Pscale):*** used to determine the concurrent, convergent, divergent and test-retest reliability.
3) ***The Keele Assessment of Participation (KAP):*** used to determine the convergent validity.
4) ***The Falls Efficacy Scale (FES):*** used to determine the divergent validity.

1.   The English version of Participation Scale (E-Pscale)

The E-Pscale, is an 18-item valid and reliable scale which uses a 5-point intensity rating scale. It addresses the ICF domains of community, social and civic life, mobility, major life domains, domestic life, learning and applying knowledge, self-care and social interactions. It is designed to be administered as an interview. The E-Pscale uses peer comparison (albeit not consistently) as a means of eliciting culturally sensitive ratings of participation. Median completion time is less than 20 minutes.[24,25]

The 18-item E-Pscale uses a 5-point intensity rating scale (no restrictions, some restrictions, but no problem, small problem, medium problem, large problem). Items are summed to obtain a total score ranging from 0 to 90. Scores may be converted to grades of participation restrictions with 0 to 12 indicating no significant restrictions, 13 to 22 indicating a mild restriction, 23 to 32 indicating a moderate restriction, 33 to 52 indicating a severe restriction and 53 to 90 indicating an extreme restriction. Cronbach's alpha was 0·92, intra-tester stability is 0·83 and inter-tester reliability is 0·80. This was used to determine the concurrent validity.

2.   *The Igbo version of Participation scale (I-Pscale)*

The English Participation Scale was translated into Igbo through a forward and back translation process. The translators were linguistic experts who are involved in the translation of health measuring instruments.[21] As in the analysis of the original English version of Participation Scale, factor analysis of the construct of the Igbo version of the scale was conducted, with an exploration of the interrelationships among scale items in order to be able to ascertain factors measuring the same construct.

The 18-item I-Pscale uses a 5-point intensity rating scale. Items are summed to obtain a total score ranging from 0 to 90 and are converted to grades of participation restrictions just like the E-Pscale. PCA analysis of the I-Pscale was 40·9%. Reliability analysis conducted using the Cronbach Alpha reliability test revealed that the overall reliability Alpha of the scale is 0·91. Most of the scale items showed a correlation coefficient of at least 0·3 with at least one other item on the scale, which suggests reasonable factorability. Secondly, the Kaiser-Meyer-Olkin measure of sampling adequacy was 0·77, and Bartlett's test of sphericity was significant (χ^2 (190) = 473·93, $P < 0·001$). Finally, the communalities were all above 0·5 confirming that each item shared some common variance with other items.[21] This was used to determine the convergent, divergent and test-retest reliability.

3.   *Keele Assessment of Participation (KAP)*

KAP was developed as a generic measure of person-perceived performance of participation "as and when you want", it is intended for use in adults in the general population. It is a self-complete questionnaire. It was published in 2005 by Wilkie *et al.*[26] it contains 15 items in a total, including four conditional screening questions (e.g. 'if yes, proceed to the next question').

Items measure participation in the domains of mobility, self-care, domestic life, interpersonal interaction, community and social life. Each item has a 5-point adjective ordinal scale (all of the time, most of the time, some of the time, a little of the time, none of the time). Each item is dichotomised to define the presence (some, a little, none of the time) or absence (all or most of the time) of participation restriction. Total scores are obtained by summing the number of items where restrictions occur (0–11 items). Scores range from 0–11 (0 = no restrictions and 1–11 = any restriction in at least one activity) with the maximum score being 11 and the minimum being 0. Median completion time is five (5) minutes or less. Cronbach's alpha was found to be 0·74. This was used to determine the convergent validity.

4. Falls Efficacy Scale

FES is a 10 item questionnaire designed to assess the confidence level of individuals in the performance of daily activities without falling. These activities include: taking a bath, reaching, walking, preparing meals and so on. This tool is targeted to the elderly who might have fear of falling which might affect the performance of activities. Each item is rated on a scale of 1–10. A score of 10 signifies no confidence in these activities; a score of 1 indicates confidence. Out of a total score of 100, a score of 70 or above indicates the individual has a fear of falling. FES takes less than 10 minutes to administer. It has an excellent test-retest reliability with an ICC of 0·71 and an internal consistency (Cronbach's alpha) of 0·91.[27] This was used to determine the divergent validity.

ETHICAL CONSIDERATIONS

Ethical approval was sought and obtained from the ethical review committee of Nnamdi Azikiwe University Teaching Hospital, Nnewi before the commencement of the study.

PROCEDURE FOR DATA COLLECTION

The permission and consent of each of the participants was sought and obtained before administering the questionnaires were administered to them. The research instruments (E-Pscale, I-Pscale, KAP and FES) were researcher administered to the participants who could read and understand both Igbo and English language.

Data Analysis

1) The demographics as well as the scores of the E-Pscale, I-Pscale, KAP and FES were summarised using frequency counts and percentages, mean and standard deviation.
2) The Spearman rank order correlation coefficient was used to analyse the correlation between the participants' score on the I-Pscale and KAP (to determine the convergent validity) as well as I-Pscale and FES (to determine the divergent validity). It was also used to analyse the correlation between the items on the E-Pscale and I-Pscale (to determine the concurrent validity).
3) The Intraclass correlation coefficient (ICC) and Bland and Altman plotting method was used to compare the scores on the I-Pscale at two different occasions in order to determine the stability (test-retest) reliability of the I-Pscale.
4) Mann-Whitney U test was used to test the differences between the scores on the E-Pscale and I-Pscale.
5) The alpha level was set at 0·05.

Results

SOCIO-DEMOGRAPHIC DISTRIBUTIONS OF THE PARTICIPANTS

Sixty subjects affected by Hansen's disease participated in the psychometric testing of the Igbo version of P-scale. They comprised of 39 males and 21 females with percentages of 65% and 35% respectively with mean age of 49·8 ± 12·8 years (Tables 1 and 2).

Table 1. Socio-demographic distribution of participants

Variable	Class	Frequency (*n*)	Percentages (%)
Gender	Male	39	65
	Female	21	35
Age group	< 18	0	0
	18–40	17	28·3
	41–60	32	53·3
	61 and above	11	18·3

The most frequently affected age group was 41 to 60 years. The Igbo version of P-scale was administered twice to only forty (40) participants.

CORRELATION BETWEEN THE ITEMS ON THE ENGLISH AND IGBO VERSIONS OF P-SCALE (CONCURRENT VALIDITY)

The correlation coefficient between the item on the English and Igbo version of P-scale were strong and ranged from 0·54–1·00: PS1 ($r = 0.99$; $P = 0.001$), PS2 ($r = 0.93$; $P = 0.001$), PS3 ($r = 0.96$; $P = 0.001$), PS4 ($r = 0.99$; $P = 0.001$), PS5 ($r = 0.94$; $P = 0.001$), PS6 ($r = 0.98$; $P = 0.001$), PS7 ($r = 0.97$; $P = 0.001$), PS8 ($r = 1.00$; $P = 0.001$), PS9 ($r = 0.94$; $P = 0.001$), PS10 ($r = 0.91$; $P = 0.001$), PS11($r = 0.93$; $P = 0.001$), PS12 ($r = 0.99$; $P = 0.001$), PS13 ($r = 0.54$; $P = 0.001$), PS14 ($r = 0.99$; $P = 0.001$), PS15 ($r = 0.99$; $P = 0.001$), PS16 ($r = 1.00$; $P = 0.001$), PS17 ($r = 1.00$; $P = 0.001$) and PS18 ($r = 0.97$; $P = 0.001$), Items 8 (Respect in the community), 16 (Does opinion count in family discussions) and 17 (Comfortable meeting new people) having the highest correlation

Table 2. Correlation between the English version of P-scale and Igbo version of P-scale among the participants

IP-scale item	EP-scale item	*r*	*p*-value
1	1	0·996	0·001
2	2	0·925	0·001
3	3	0·962	0·001
4	4	0·990	0·001
5	5	0·942	0·001
6	6	0·984	0·001
7	7	0·972	0·001
8	8	1·000	0·001
9	9	0·941	0·001
10	10	0·909	0·001
11	11	0·934	0·001
12	12	0·995	0·001
13	13	0·537	0·001
14	14	0·988	0·001
15	15	0·998	0·001
16	16	1·000	0·001
17	17	1·000	0·001
18	18	0·966	0·001

KEY: **IP** = Igbo Participation scale, **EP** = English Participation scale.

coefficient and item 13 (Visit to public places) having the lowest correlation coefficient. All the items were all significant showing excellent correlation between the two instruments.

COMPARISON BETWEEN THE TOTAL E-PSCALE SCORE AND TOTAL I-PSCALE SCORE (CONCURRENT VALIDITY), TOTAL I-PSCALE SCORE AND TOTAL KAP SCORE (CONVERGENT VALIDITY) AND TOTAL I-PSCALE SCORE AND TOTAL FES SCORE (DIVERGENT VALIDITY)

There was a significant correlation between the total E-Pscale score and total I-Pscale score ($r = 0.99$; $P = 0.001$) and also there was no significant difference between the total E-Pscale score and total I-Pscale score ($U = 1799.00$; $P = 0.99$). The scores on the total component of Igbo P-scale and that of the KAP showed significant correlation: ($r = 0.806$; $P = 0.001$). The total scores on the Igbo P-scale and FES showed significant correlation: FES ($r = 0.290$; $P = 0.024$).

TEST-RETEST RELIABILITY

Test-retest was analysed for forty (40) of the participants (31 males, 9 females) who were randomly picked. Their mean age was 49.00 ± 12.60 years. The IP-scale scores at the first and second visit were 36.93 ± 21.93 and 37.23 ± 22.11 respectively (Figure 1).

Test-retest reliability analysis gave an ICC with a lower border of 0.98 and an upper border of 0.99 (0.98–0.99) and a P value of 0.001 ($P = 0.001$) indicating an excellent reliability. However, graphic analysis by the Bland and Altman plotting method revealed that the test retest results were not strictly centered. The limits of the agreement for the two scores were from -5.89 to 6.49 and a bias of 0.3 ± 3.16 (Figure 2).

Discussion

PSYCHOMETRIC PROPERTIES OF THE IGBO VERSION OF PARTICIPATION SCALE (IP-SCALE)

The aim of the study was to determine the concurrent, convergent and divergent validity and also the stability (test-retest) reliability of the Igbo version of the participation scale (IP-scale).
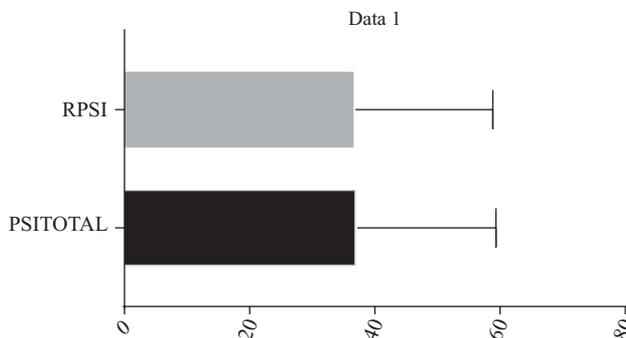

Figure 1. Mean scores of the I-Pscale on first and second visit. KEY: PSITOTAL – Mean scores on first visit of test-retest, RPSI – Mean score on second visit of test-retest.
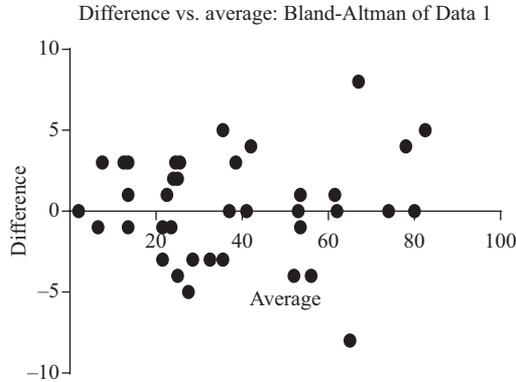
Figure 2. Bland and Altman plot of test-retest scores of the IP-scale.

The results obtained in this study showed that there was significantly high correlation between the scores obtained on the first and second administration of the Igbo version of P-scale using Intra-Class Correlation (ICC) showing a strong reliability. This high correlation was similar to that reported by Stevelink *et al.* in their study on testing the psychometric properties of the P-scale in Eastern Nepal, wherein a correlation of 0·90 was obtained with lower and upper class boundaries of (CI) 0·85−0·94.[22] This could be explained by the fact that both populations have some level of disability and both might likely face some level of stigmatisation and therefore participation restrictions. Carlijn *et al.* also reported a correlation coefficient of 0·82 in their study on reproducibility of three self-reported Participation measures (IMPACT-S, USER-P and P-scale) in Netherlands.[20] Futhermore the ICC value of P-scale was reported to be similar to the ICC's of other participation measures like: The ICF Measure of Participation And Activities Screener (ICC = 0·54−0·90) and the Utrecht Scale For Evaluation Of Rehabilitation-Participation (ICC = 0·85).

Although the ICC for the test-retest can be considered excellent, graphic representation of the test-retest scores by the Bland-Altman method revealed that despite a marginal number of out layers, the scores were not all centered, with asystemic trend observed.

Significant correlation was observed between the total scores obtained on the English and Igbo version of P-scale. A strong validity was thus indicated by the observed correlation which suggeststhat IP-scale is a valid instrument for use in persons affected by Hansen's disease in South-Eastern region of Nigeria.

Strong correlation coefficient was observed between the items in the English and Igbo version of P-scale, indicating good concurrent validity. The test of the difference between the total EP-scale score and IP-scale score reveals that there was no significant difference between the two versions which suggests that the IP-scale was excellently translated and culturally adapted to the Igbo culture which showed as a good concurrent validity and therefore is a valid instrument for use in people with Hansen's disease in South-eastern, Nigeria. Also, the results from this study showed a significant correlation between the IP-scale score and the KAP score showing a good convergent validity.This was found to be similar to the convergent validity scores (P-scale and EMIC) ($r = 0·55$; $P < 0·001$) of the P-scale translation and validation in Eastern Nepal.[22]

Also, a significant correlation was found between the IP-scale score and the FES score which was found to be in discordance with the P-scale Nepal version (P-scale and self reported health scale).[22]

Conclusion

The outcome of this study has established a psychometrically sound Igbo version of the Participation Scale available for assessing the extent of participation restrictions among Igbo monolinguals in Nigeria who are affected by Hansen's disease, disabilities and other stigmatised conditions in Igbo speaking areas. In other words, the scale will be used to measure participation for use in rehabilitation, stigma reduction and social integration programme. It will also go a long way to allow the collection of participation data and impact assessment of interventions to improve social participation. The Igbo version of P-scale is a valid and reliable tool for measuring participation restrictions among Igbos affected by Hansen's disease or disability.

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