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# Cultural adaptation and psychometric evaluation of the Yoruba version of the Health Literacy Questionnaire

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*Key words: Psychometric, Evaluation, Yoruba, Version, Health, Literacy, Questionnaire*

*Parole chiave: Psicrometrico, Valutazione, Yoruba, Versione, Salute, Alfabetizzazione, Questionario*

## Abstract

**Background.** Health literacy is an important multidimensional concept of public health concern and a determinant of health outcomes and access to healthcare which requires robust measurement. The objective of this study was to culturally adapt and establish the psychometric properties of the Yoruba version of the Health Literacy Questionnaire.

**Methods.** A cross-sectional survey of Nigeria Yoruba speaking adults was conducted with the Health Literacy Questionnaire following its translation and adaptation. Data were subject to psychometric evaluation (confirmatory factor analysis, composite reliability, Cronbach's alpha, intra class correlation) and association with sociodemographic variables.

**Results.** A total of 258 adults with mean age 26.7 years participated in the study. The easiest scale to score highly was 'Actively managing my health' and hardest was 'Ability to find good health information' and 'Navigating the healthcare system'. Six one-factor models fitted well without correlated residuals but the other three had a good fit after model modification. Composite reliability and Cronbach's  $\alpha$  of  $\geq 0.7$  were observed for all scales, suggesting good internal consistency of the scales. Test-retest reliability of the Yoruba translation of the Health Literacy Questionnaire was moderate to good in all scales, intra class correlation ranging from 0.66 to 0.76.

**Conclusion.** The Health Literacy Questionnaire was successfully translated and culturally adapted and demonstrated good content and construct validity and high composite reliability. The Yoruba translation of the Health Literacy Questionnaire has the potential of being a useful clinical tool for the assessment of health literacy, especially among Yoruba speaking community of Nigeria. Thereby helping to improve the health outcomes through access to healthcare.

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## Introduction

Health literacy has been much advocated in the management of chronic disease (1), and the rehabilitation professionals are increasingly holding leadership roles in management of chronic disease. Effective information exchange is therefore important in rehabilitation practice, since this constitutes a fundamental component of most patient-practitioner encounters, particularly in the context of self-management (2, 3). The health literacy is a resource for patients that allow them to understand and engage in the management of their own and their families' illness, particularly in the management of chronic disease. In order to do this effectively, we must consider how information is made available and the manner in which it is delivered, and ultimately understood. As the requirement for self-management in healthcare is increasingly emphasized, especially in the management of chronic conditions, patients are asked to assume greater responsibility for their own health.

Health information, expected to be comprehended by healthcare consumers, is in the form of one-on-one interactions with healthcare professionals, as it is in rehabilitation (4, 5). The level of skills and competencies required by individuals varies with the contextual demands, such as the complexity of the healthcare system, access to health information or patient education, communication skills of health professionals and the availability of social mobilization (6-8). This is because communication skills are a component of health literacy too, although health literacy is tied to more complex social structures than education (9, 10). Healthcare consumers need to be able to ask health professionals for information about diagnoses and treatment options, to understand the answers provided to them as regards their present conditions and then pass along that health information to family and friends as needed (4, 5).

The Health Literacy Questionnaire (HLQ) is a critical advancement in health literacy measurement. It has been designed to provide practitioners, organisations and governments with data describing the health literacy strengths and limitations of individuals and populations. These data allow development and selection of fit-for-purpose response strategies that optimise opportunities to improve access to healthcare and health outcomes (6). The HLQ has been employed in a number of studies and translated into different languages, including German and Asia translation (11-14). However, the HLQ has not been translated and culturally adapted to any of Nigeria local languages, including Yoruba language. Yoruba being one of the most spoken language in Nigeria and spoken in part of some other west African countries (15). It is estimated that about 56 million people speak the language in Nigeria (15). The appropriateness of a tool may vary across settings. Therefore, it is imperative to establish that a tool has been demonstrated culturally and linguistically appropriate and has strong measurement properties before using such tool to make decisions about individuals, communities or organisations, or to compare across settings (11, 14). Some Yoruba speakers are not literate in English and as such this may impact on their access to healthcare. Therefore, there is the need to establish the psychometric properties of the Yoruba version HLQ to facilitate its adoption by the Yoruba population. The objective of this study is to determine the psychometric properties of Yoruba version of HLQ.

## Methods

### Study design and setting

A cross sectional study included individuals residing in Ile-Ife communities of Osun State, Nigeria. The participants were 18 years and older and were literate in

Yoruba language, and without any obvious cognitive and mental impairment. Ethical approval was sought and obtained from Health Research and Ethics Committee (HREC) of the Institute of Public Health, Obafemi Awolowo University, Ile-Ife (HREC NO: IPHOAU/12/1179).

## Instruments

### *The Health Literacy Questionnaire (HLQ)*

The HLQ consists of 44 questions and nine conceptually distinct areas of health literacy used to assess the needs and challenges of a wide range of people and organisations. It can be either self-administered or interviewer-administered. The nine scales are: 1) Feeling understood and supported by healthcare providers (four items); 2) sufficient information to manage my health (four items); 3) Actively managing my health (five items); 4) Social support for health (five items); 5) Appraisal of health information (five items); 6) Ability to actively engage with healthcare providers (five items); 7) Navigating the healthcare system (six items); 8) Ability to find good health information (five items) and 9) Understand health information well enough to know what to do (five items). The response on the scales were either 4- or 5-point ordinal options. Scales 1-5 were 4-point ordinal Likert response (1 = strongly disagree, 2 = disagree, 3 = agree and 4 = strongly agree) while scales 6-9 were 5-point ordinal response (1 = cannot do, 2 = very difficult, 3 = quite difficult, 4 = quite easy and 5 = very easy). It has excellent psychometric properties, strong construct validity, strong reliability, and has been shown to provide unbiased mean estimates of group differences (6).

### *Translation procedure of Yoruba version of HLQ*

A Research license agreement was

obtained from Deakin University ([https://www.deakin.edu.au/data/assets/word\\_doc/0010/633538/hlq.docx](https://www.deakin.edu.au/data/assets/word_doc/0010/633538/hlq.docx)), after an agreement was reached for use of the English version HLQ questionnaire for the study. The English version of the HLQ was translated into Yoruba version using a stepwise protocol developed by Deakin University (16). The protocol was applied in sequential order as follows;

#### **A. Forward Translation of the HLQ:**

The lead forward translator (FT1) was a native speaker of the Yoruba language with a very high level of proficiency (fluency) in English (an expert from the Yoruba department of University of Ibadan, Ibadan Nigeria). The FT1 translated the HLQ from English to Yoruba language, and then confers with the second forward translator (FT2) who translated the same to decide on a final version. The forward translators consulted the Item intent document carefully for each question. The forward translators worked closely to achieve a final recommended (consensus) forward translation. The FT1 and FT2 needed to agree that the translation is as close to the conceptual meaning of the original English HLQ.

**B. Backward Translation of the Health Literacy Questionnaire:** The backward translation (BT) was represented by a native speaker of English with a very high level of proficiency (fluency) and technical qualifications in the Yoruba language. The BT was blinded to the original English version. The BT translated the consensus forward translation back to English. The aim was for the researcher to discover, through the back translation and discussion with the forward translators how close in meaning the forward translation was to the original English HLQ. Subsequently, there was a consensus teleconference to reach a final Yoruba translation of the HLQ. Prior to the consensus teleconference, the researcher prepared the item intent and translation management grid with both

forward and backward translations and sent it electronically to the chairperson of Deakin University Australia who had developed the English version of the HLQ (6). He then prepared a commentary on the backward translation in the Translation Management Grid. The chairperson examined all aspects of each question, especially the relative strength of the wording, how all questions work together in a scale, and challenged the choice of words across scales.

**C. Forward and Backward Translators alerted to discrepancies:** The researcher distributed the Item Intent and Management Grid with the developer's comments to all translators. All discrepancies or discussion points were clearly highlighted ready for the Skype teleconference with the developer of the questionnaire, the researcher, the forward translator, back translator and lay people subsequently the teleconference took place.

**D. Skype teleconference to finalize the HLQ in the Yoruba language:** The aim of the teleconference was for the team to clarify and agree upon remaining concerns about the accuracy of the consensus forward translation which may include in-depth discussions about the meaning of words or phrases used in the translation to determine if the words convey the same or comparable concept as the English HLQ.

**E. The HLQ:** 10 Yoruba speaker participants were recruited for a pretesting of the cognitive debriefing interview after which the final culturally adapted Yoruba version used in this study was produced. Individuals receiving physiotherapy at selected hospitals were recruited for this study.

The final version Y-HLQ was administered to the participants after explaining the purpose and procedures of the research work and obtaining their consent prior to data collection. To examine the test retest reliability of Y-HLQ, participants were asked

to complete the questionnaire again two weeks after and the scores were compared with the initial rating.

#### *Data analysis*

Descriptive statistics of mean, standard deviation and percentages were used to assess the sociodemographic characteristics and for each item to assess missing data and estimate difficulty level. For scales with "disagree/agree" response options, the difficulty level was calculated as the proportion responding "disagree" and "strongly disagree" as against "agree" or "strongly agree". For scales with response options "cannot do" to "very easy", the difficulty level was calculated as the proportion responding "cannot do", "very difficult", or "quite difficult" as against "quite easy" and "very easy" (12).

Given that the HLQ scales were specified a priori, confirmatory factor analysis (CFA) was undertaken. Using one-factor CFA, a model was fitted to the data for each previously confirmed scale (6) and robust Maximum Likelihood was used for parameter estimation. To evaluate the fitness of these models, fit indices "unstandardized and standardized" factor loadings, estimation of variance of measured variables explained by the latent variable ( $R^2$ ), Root Mean Square Error of Approximation (RMSEA), Tucker-Lewis Index (TLI), and the Comparative Fit Index (CFI) were applied. For the RMSEA, a value of  $\leq 0.05$  was interpreted as close fit, while values of  $\leq 0.08$  were interpreted as acceptable fit and for both TLI and CFI a cut-off value of  $\geq 0.95$  was applied (12,13).

Composite reliability, Cronbach's alpha ( $\alpha$ ) and intraclass correlation coefficients (ICC) were used to determine reliability of Yoruba version of the HLQ questionnaire. Two-way mixed model ICC and average measures using a consistency definition approach was used. ICC and  $\alpha$  of  $\geq 0.70$  is set as good internal consistency and reliability (17). Data were analysed using IBM SPSS Statistics version 23.0, Amos

version 23.0 and Mplus version 8.4. Alpha level was set at 0.05.

## Results

### *Sociodemographic characteristics of the respondents*

Table 1 shows the sociodemographic characteristics of the participants. The mean age of the 258 participants was 26.7±9.7 years. There were more women

(54%) participants than men, with 71% of them living with their partners. Most of the participants (62%) had completed both technical and further education and University education, work full time (24%) and 19% of them had a longstanding illness or disability.

### *Report of translation*

During the first expert committee meeting, in which the forward translation of the HLQ was achieved, questions 4, part 1 (I compare health information from different sources) and question 12, part 1 (I always compare health information from different sources and decide what is best for me) were adjusted to fit cultural use and simplicity, for the convenience of target users. 'Different sources' was replaced with 'different people' for cultural reasons. Presenting the concept of these questions in this manner would be more explicit to a layman/target user. In use of Yoruba language, the expression 'getting information from different sources' is better appreciated by the user of the language as 'getting information from different people'.

Following the second expert meeting, which took place with a skype call, involving the original author of the HLQ, the Principal investigator, the Lead forward translator (FT1), the second forward translator (FT2), the backward translator (BT), a consensus was reached and a penultimate version of the Yoruba HLQ was obtained. This version was therefore subjected to a pre-testing. However, somebody suggested that some items should be modified. Question 5, part A "Tí ara mi ò bá yá, àwọn èniyàn tí ó wà láyíká mi máa n mọ ohun tí mò n là kojá" should be replaced with 'Tí ara mi ò bá yá, àwọn èniyàn tí ó wà láyíká mi máa n mọ **nitooto** ohun **pato** tí mò n là kojá' for better understanding. Question 6, part A "Mo máa n lo òpòlòpò àkókò láti boju tó ìlera mi gidi gan-an" should be "Mo máa n lo òpòlòpò àkókò **to nitumo** láti boju tó ìlera mi gidi gan-an"

Table 1 - characteristics of the participants

Variable	Mean±SD	n	%
<b>Age (years)</b>	26.7±9.7		
≤18		18	7
19-29		188	73
30-40		34	13
41-51		8	3
≥52		10	4
<b>Gender</b>			
Male		119	46
Female		139	54
<b>Relationship status</b>			
Living with partner		183	71
Living alone		75	29
<b>Level of education</b>			
Primary school		8	3
High school complete		88	34
TAFE/University		160	62
Post graduate school		3	1
<b>Employment status</b>			
Working full time		62	24
Working part time		16	6
Home duties		18	7
Full time student		142	55
Part time student		10	4
Retired		8	3
Others		3	1
<b>Long standing illness</b>			
Arthritis /Back		3/28	1/11
Heart problems/asthma/		5/3/0	2/1/0
Depression/diabetes/		8/3/0	3/1/0
Others/none		3/206	1/80

to depict the totality of the time dedicated to managing one's health. Question 7, part A "Bí mo bá rí imò ilera tuntun, mo máa ñ sàyèwò bóyá ó jẹ òótó tàbí iró", participants suggested that "se iwadi" better explains 'sàyèwò' to a layman. In Question 11, part A "Mo ní òpò èniyàn tó se é gbára lé tí mo bá nilò irànwóló", participants suggested that "gbokan le" should take the place of "gbára lé" for a deeper understanding of the original word "rely on". Also, Question 9 part B "Tèlè àwọn ilàná tí àwọn elétò ilera là kalè doju àmì", participants suggested "Tèlè àwọn ilàná tí àwọn elétò ilera là sile daadaa".

#### *Data quality of the translated Health Literacy Questionnaire*

Tables 2 present the data quality of the translated Yoruba version HLQ. Response to the HLQ items was high (missing answers: 0-3%). HLQ was divided into two parts i.e. part 1 having 5 scales (1-5) and part 2 having 4 scales (6-9). At the item level there were missing data on item '4.1', '6.1', '8.2', '8.5', '9.1' and '9.3'. Scale 7 (i.e. navigating the health care system) had 6 items. In part 1, scale '3.3' had the highest mean of 3.16 and scale '2.4' had the lowest mean of 2.60. In part 2 of this scale 8.2 reported to have the highest percentage of "cannot do" (6.6%) and the lowest was 6.2 i.e. 0.8%. Scale 7.1 had the highest percentage of "very difficult" (22.1%) and the lowest was in scale 9.5 i.e. (3.1%). The first five scales, compared with the last four scales, are relatively easiest at the item level. The scales that were easiest to score highly were 3. 'Actively managing my health' with average item difficulty of 0.33). The scales that were hardest to score highly were 8. 'Ability to find good health information' (0.81) and 7. 'Navigating the healthcare system' (0.81). The two easiest items were found in scale 3. 'Actively managing my health' [3.3 'Despite other things in my life, I make time to be healthy' (0.18) and 3.5 'There are things that I do

regularly to make myself more healthy' (0.18)], while the two hardest items were in scale 7. 'Navigating the healthcare system' [7.1 'Find the right healthcare' (1.04)] and scale 8. 'Ability to find good health information' [8.2 'Find health information from several different places' (1.04)]. The scale with the smallest range of difficulty was 1. 'Feeling understood and supported by healthcare providers' (hardest 0.43, easiest 0.32, range 0.11), while 2. 'Having sufficient information to manage my health' had the largest range of difficulties (hardest 0.92, easiest 0.18, range 0.75).

#### *Psychometric properties of Yoruba version of HLQ*

The model fit for all scales was generally very good, demonstrating that the scales are homogeneous. The one-factor models returned satisfactory close fit for six scales (1, 4, 6, 7, 8, 9) while other three were not. However, after model modification, the model fit for other three scales were perfectly fit after including correlation residuals (maximum 2) ranged from 0.12 (scale 3) to 0.21 (scale 2) (Table 3). The nine-factor model suggests satisfactory fit to data. The fit indices of nine-factor model were:  $\chi^2_{ML} = 253.8$ ,  $p = 1.0$ , RMSEA = 0.0. The factor loadings in each nine scales were satisfactory ( $p > 0.50$ ) with exception of five items (3.4, 4.2, 5.4, 5.5, 7.6). The median factor loading was 0.63. About 70% of factor loadings were similar to the original English version. The highest factor loading deviation was seen in item 3.4 'I set my own goals about health and fitness' (0.28). A composite reliability and Cronbach's  $\alpha$  of  $\geq 0.7$  was observed for all the scales suggesting good internal consistency of the scales. The median composite reliability was 0.76 ( $\alpha = 0.75$ ), with highest in scale 2. 'Having sufficient information to manage my health' (0.87) and lowest in scale 5. 'Appraisal of health information' (0.70). The test-retest reliability of Y-HLQ was 'moderate to

Table 2a - Data quality of the translated Health Literacy Questionnaire (HLQ) in a Yoruba population (n = 258)

Subscale/item	Obs	Missing n(%)	Median	Mean (SD)	Strongly disagree (%)	Disagree (%)	Strongly agree (%)	Agree (%)	Difficulty level
<b>1. Feeling understood and supported by healthcare providers</b>									
I have at least one healthcare provider who knows me well ...	258	0	3	2.82(0.868)	9.3	20.2	49.6	20.9	37.0
I have at least one healthcare provider I can discuss ...	258	0	3	3.03(0.857)	6.2	16.3	45.3	32.2	31.6
I have the healthcare providers I need to help me work ...	258	0	3	2.90(0.805)	6.2	19.0	53.1	21.7	37.0
I can rely on at least one healthcare provider ...	258	0	3	2.93(0.743)	5.4	14.7	60.9	19.0	42.9
<b>2. Having sufficient information to manage my health</b>									
I feel I have good information about health	258	0	3	2.60(0.895)	7.0	13.6	52.3	27.1	17.6
I have enough Information to help Me deal with my ...	258	0	3	2.67(0.820)	8.1	30.6	46.9	14.3	47.1
I am sure I have all the information I need to manage ...	258	0	3	2.61(0.835)	10.9	29.1	48.1	12.0	69.5
I have all the information I need to look after my health	258	0	3	2.60(0.895)	11.2	34.5	37.6	16.7	92.3
<b>3. Actively managing my health</b>									
I spend quite a lot of time actively managing my health	258	0	3	2.91(0.902)	8.1	20.9	42.6	28.3	63.9
I make plans for what I need to do to be healthy	258	0	3	3.08(0.712)	5.0	6.6	64.0	24.4	8.7
Despite other things in my life, I make time to be healthy	258	0	3	3.16(0.769)	5.4	6.6	55.0	32.9	17.6
I set my own goals about health and fitness	258	0	3	2.63(0.784)	8.9	29.1	51.9	10.1	51.5
There are things that I do regularly to make myself more healthy	258	0	3	3.06(0.730)	3.9	12.0	58.1	26.0	17.6
<b>4. Social support for health</b>									
I can get access to several people who understand and ...	256	2	3	2.95(0.715)	3.9	16.3	60.1	19.0	22.0
When I feel ill, the people around me really understand ...	258	0	3	2.88(0.856)	7.4	20.9	47.7	24.0	37.0
If I need help, I have plenty of people I rely on	258	0	3	2.67(0.848)	8.5	31.8	43.4	16.3	72.4
I have at least one person who can come to medical ...	258	0	3	2.83(0.871)	10.9	15.5	53.9	19.8	42.9
I have strong support from family and friends	258	0	3	2.93(0.837)	5.4	22.1	46.1	26.4	23.5
<b>5. Appraisal of health information</b>									
I compare health information from different sources	258	0	3	2.78(0.909)	11.6	19.8	47.7	20.9	44.9
When I see new information about health, I check up ...	258	0	3	3.03(0.824)	5.8	14.7	49.6	29.8	33.3
I always compare health information from different sources ...	258	0	3	3.00(0.777)	3.9	18.2	51.6	26.4	37.0
I know how to find out if the health information I receive is ...	258	0	3	2.92(0.755)	5.0	17.4	57.8	19.8	31.6
I ask healthcare providers about the quality of the ...	258	0	3	2.88(0.707)	4.7	17.4	62.8	15.1	44.9



Table 2b - Data quality of the translated Health Literacy Questionnaire (HLQ) in a Yoruba population (n = 258)

Subscale/item	Obs	Missing n(%)	Median	Mean (SD)	Cannot do (%)	Very difficult (%)	Quite difficult (%)	Quite easy (%)	Very easy (%)	Difficulty level (%)
6. Ability to actively engage with healthcare providers										
Make sure that healthcare providers understand your ...	257	1	4	3.58(1.02)	3.9	8.5	32.9	34.9	19.4	75.4
Feel able to discuss your health concerns with a ...	258	0	4	3.77(0.98)	0.8	10.1	27.1	35.3	26.7	55.4
Have good discussions about your health with doctors	258	0	4	3.66(0.99)	1.9	10.9	27.1	39.1	20.9	47.1
Discuss things with healthcare providers until you understand ...	258	0	4	3.84(0.93)	2.7	3.9	24.4	44.6	24.4	63.9
Ask healthcare providers questions to get the ...	258	0	4	3.88(0.95)	1.9	6.6	20.2	43.8	27.5	53.8
7. Navigating the healthcare system										
Find the right healthcare	258	0	4	3.19(1.07)	5.0	22.1	33.7	26.7	12.4	104.1
Get to see the healthcare providers I need to	258	0	4	3.72(0.99)	3.1	8.9	21.3	46.1	20.5	78.6
Decide which healthcare provider you need to see ...	258	0	4	3.72(0.93)	3.5	3.9	28.3	45.3	19.0	96.1
Make sure you find the right place to get the health ...	258	0	4	3.92(0.95)	2.7	4.3	20.2	43.1	29.1	58.7
Find out what healthcare services you are entitled to ...	258	0	4	3.59(1.00)	2.3	10.1	19.4	44.6	23.6	66.7
Work out what is the best care for you	258	0	4	3.52(1.10)	5.4	11.6	28.7	34.5	19.8	78.6
8. Ability to find good health information										
Find information about health problems	258	0	4	3.52(0.99)	2.3	15.1	24.8	43.4	14.3	78.6
Find health information from several different places	255	3	4	3.67(1.09)	6.6	6.6	20.2	44.6	20.9	104.1
Get information about health so you are up to date ...	258	0	4	3.77(0.92)	2.7	5.0	24.4	48.1	19.8	61.3
Get health information in words you understand ...	258	0	4	3.97(1.01)	1.9	7.0	19.4	35.3	36.4	63.9
Get health information by yourself	256	2	4	3.62(1.03)	5.0	6.2	29.8	38.8	19.4	96.1
9. Understanding health information well enough to know what to do										
Confidently fill medical forms in the correct way	257	1	4	3.90(0.92)	1.2	5.8	22.9	41.9	28.3	25.0
Accurately follow the instructions from healthcare providers	258	0	4	3.82(0.98)	1.2	7.4	24.8	38.8	27.1	44.9
Read and understand written health information	257	1	4	3.72(1.02)	2.3	7.8	24.4	36.0	29.1	49.3
Read and understand all the information on medication labels	258	0	4	3.95(0.96)	1.2	7.0	20.5	38.0	33.3	66.7
Understand what healthcare providers are asking you to do	258	0	4	3.96(0.95)	3.1	3.1	19.0	44.6	30.2	49.3

Table 3 - Psychometric properties of Yoruba version of the Health Literacy Questionnaire

Item	Factor loading	R <sup>2</sup>	CR ( $\alpha$ )	ICC (95% CI)
<b>1. Feeling understood and supported by healthcare providers</b>				
I have at least one healthcare provider who knows me well ...	0.71	0.51	0.75 (0.74)	0.67 (0.58 - 0.74)
I have at least one healthcare provider I can discuss ...	0.83	0.68		
I have the healthcare providers I need to help me work ...	0.52	0.27		
I can rely on at least one healthcare provider ...	0.52	0.27		
Model fit - $\chi^2(ML) = 2.169$ , $P=0.338$ , $CFI = 0.994$ , $TLI = 0.983$ , $RMSEA = 0.029$ (0.000–0.204)				
<b>2. Having sufficient information to manage my health</b>				
I feel I have good information about health	0.80	0.65	0.87 (0.77)	0.71 (0.63 - 0.77)
I have enough Information to help Me deal with my ...	0.86	0.75		
I am sure I have all the information I need to manage ...	0.78	0.61		
I have all the information I need to look after my health	0.70	0.49		
Fit with one correlated residual - $\chi^2(ML) = 0.094$ , $P=0.759$ , $CFI = 1.000$ , $TLI = 1.052$ , $RMSEA = 0.000$ (0.000–0.181)				
<b>3. Actively managing my health</b>				
I spend quite a lot of time actively managing my health	0.59	0.35	0.76 (0.72)	0.76 (0.69 - 0.81)
I make plans for what I need to do to be healthy	0.69	0.48		
Despite other things in my life, I make time to be healthy	0.71	0.51		
I set my own goals about health and fitness	0.28	0.08		
There are things that I do regularly to make myself more healthy	0.80	0.64		
Fit with two correlated residual - $\chi^2(ML) = 4.881$ , $P=0.181$ , $CFI = 0.986$ , $TLI = 0.954$ , $RMSEA = 0.080$ (0.00–0.202)				
<b>4. Social support for health</b>				
I can get access to several people who understand and ...	0.63	0.40	0.72 (0.72)	0.71 (0.63 - 0.77)
When I feel ill, the people around me really understand ...	0.42	0.18		
If I need help, I have plenty of people I rely on	0.63	0.40		
I have at least one person who can come to medical ...	0.59	0.35		
I have strong support from family and friends	0.64	0.41		
Model fit - $\chi^2(ML) = 6.491$ , $P=0.261$ , $CFI = 0.982$ , $TLI = 0.963$ , $RMSEA = 0.055$ (0.000–0.157)				
<b>5. Appraisal of health information</b>				
I compare health information from different sources	0.63	0.40	0.70 (0.70)	0.71 (0.63 - 0.77)
When I see new information about health, I check up ...	0.61	0.37		
I always compare health information from different sources ...	0.72	0.52		
I know how to find out if the health information I receive is ...	0.44	0.20		
I ask healthcare providers about the quality of the ...	0.39	0.16		

Fit with two correlated residual - $\chi^2(ML) = 3.181, P=0.365, CFI = 0.998, TLI = 0.993, RMSEA = 0.025 (0.000-0.173)$			
6. Ability to actively engage with healthcare providers		0.81 (0.81)	0.73 (0.65 - 0.79)
Make sure that healthcare providers understand your ...	0.66	0.44	
Feel able to discuss your health concerns with a ...	0.67	0.45	
Have good discussions about your health with doctors	0.84	0.71	
Discuss things with healthcare providers until you understand ...	0.60	0.36	
Ask healthcare providers questions to get the ...	0.59	0.35	
Model fit - $\chi^2(ML) = 2.461, P=0.782, CFI = 1.000, TLI = 1.000, RMSEA = 0.000 (0.000-0.092)$			
7. Navigating the healthcare system		0.80 (0.79)	0.69 (0.61 - 0.76)
Find the right healthcare	0.62	0.40	
Get to see the healthcare providers I need to	0.80	0.63	
Decide which healthcare provider you need to see ...	0.61	0.37	
Make sure you find the right place to get the health ...	0.71	0.51	
Find out what healthcare services you are entitled to ...	0.54	0.29	
Work out what is the best care for you	0.46	0.21	
Model fit - $\chi^2(ML) = 11.988, P=0.214, CFI = 0.980, TLI = 0.966, RMSEA = 0.058 (0.000-0.134)$			
8. Ability to find good health information		0.77 (0.76)	0.70 (0.62 - 0.77)
Find information about health problems	0.73	0.53	
Find health information from several different places	0.70	0.49	
Get information about health so you are up to date ...	0.70	0.49	
Get health information in words you understand ...	0.61	0.37	
Get health information by yourself	0.42	0.18	
Model fit - $\chi^2(ML) = 5.437, P=0.365, CFI = 0.996, TLI = 0.992, RMSEA = 0.030 (0.000-0.145)$			
9. Understanding health information well enough to know what to do		0.75 (0.75)	0.66 (0.56 - 0.73)
Confidently fill medical forms in the correct way	0.57	0.33	
Accurately follow the instructions from healthcare providers	0.63	0.40	
Read and understand written health information	0.65	0.43	
Read and understand all the information on medication labels	0.63	0.39	
Understand what healthcare providers are asking you to do	0.59	0.35	
Model fit - $\chi^2(ML) = 1.326, P=0.932, CFI = 1.000, TLI = 1.000, RMSEA = 0.000 (0.000-0.039)$			

CR = Composite reliability,  $\alpha$  = Cronbach's alpha, ICC = Interclass correlation coefficient for test-retest  
 \*correlations significant at  $P=0.01$  (2-tailed)

Table 4 - Spearman correlations of the nine factors of the Y-HLQ

Scale	1	2	3	4	5	6	7	8
2	0.313							
3	0.495	0.388						
4	0.486	0.400	0.495					
5	0.483	0.481	0.563	0.513				
6	0.462	0.250	0.345	0.274	0.346			
7	0.460	0.311	0.300	0.326	0.454	0.765		
8	0.387	0.306	0.232	0.308	0.441	0.612	0.736	
9	0.403	0.165	0.256	0.233	0.347	0.706	0.660	0.614

**KEYS**

- 1= Feeling understood and supported by healthcare providers,  
 2= Having sufficient information to manage my health,  
 3= Actively managing my health,  
 4= Social support for health,  
 5= Appraisal of health information,  
 6= Ability to actively engage with healthcare providers,  
 7= Navigating the healthcare system,  
 8= Ability to find good health information,  
 9= Understanding health information well enough to know what to do

good' in all scales ranging from 0.66 to 0.76 (median, 0.71) with exception of scale 9. 'Understanding health information well enough to know what to do' (0.39).

*Factor correlations*

The inter-factor correlations between the nine Y-HLQ ranged between 0.165 (2/9) and 0.765 (6/7). Scales 1-5 showed small to medium correlations while scales 6-9 showed high correlations (Table 4). None of the inter-factor correlations was  $\geq 0.8$ , which suggests good discriminant validity.

*Correlation of sociodemographic vs Health Literacy Questionnaire-Yoruba*

The Y-HLQ scales were related to the socio-demographics and clinical characteristics of the respondents (Table 5). While the items were written specifically to avoid potential bias in gender, age and education. The coefficient correlations range from 0.001 to 0.326. The correlation between age and Y-HLQ scale 9 yielded the

highest correlation of 0.326, while the lowest co-efficient was found between sex and Y-HLQ scale 1 ( $r = 0.001$ ). Below are lists of socio-demographic and clinical variables that yielded significant correlation with Y-HLQ scales - Age/Scale 1 (i.e. Feeling understood and supported by healthcare providers), Age/scale 7 (i.e. Navigating the healthcare system ), Age/scale 8 (i.e. Ability to find good health information ), Age/scale 9 (i.e. Understanding health information well enough to know what to do), employment status/scale 4 (i.e. Social support for health), back pain/scale1 (i.e. Feeling understood and supported by healthcare providers ), depression/scale 8 (i.e. Ability to find good health information),depression/scale 9 (i.e. Understanding health information well enough to know what to do) with the  $r(p)$  values of 0.247 (0.006), 0.213 (0.033), 0.233 (0.019), 0.326 (0.001), 0.257 (0.010), 0.208 (0.037), 0.202 (0.044), and 0.270 (0.007), respectively.

Table 5 - Correlation (r) of physical and clinical characteristics with Y-HLQ

Variable/scale	1	2	3	4	5	6	7	8	9
Age	0.274*	0.053	0.010	0.164	0.034	0.099	0.213**	0.233**	0.326***
Sex	0.001	0.048	0.095	0.071	0.071	0.104	0.002	0.067	0.115
Education	0.129	0.127	0.065	0.016	0.025	0.039	0.145	0.088	0.189
Employment Status	0.009	0.011	0.054	0.257*	0.119	0.123	0.160	0.149	0.106
Mother tongue	0.045	0.016	0.044	0.075	0.048	0.049	0.185	0.157	0.045
Arthritis	0.151	0.105	0.056	0.168	0.039	0.075	0.080	0.075	0.114
Back pain	0.208**	0.019	0.019	0.036	0.015	0.054	0.024	0.072	0.175
Heart problems	0.196**	0.114	0.041	0.171	0.027	0.107	0.114	0.129	0.162
Asthma	0.170	0.130	0.161	0.072	0.170	0.165	0.168	0.152	0.154
Depression	0.150	0.033	0.001	0.163	0.097	0.097	0.144	0.202**	0.270*
Diabetes	0.151	0.105	0.056	0.168	0.039	0.075	0.080	0.075	0.114
Others	0.037	0.104	0.096	0.161	0.126	0.067	0.007	0.053	0.070
None	0.226**	0.100	0.130	0.027	0.048	0.145	0.059	0.031	0.126

**KEYS**

1= Feeling understood and supported by healthcare providers,

2= Having sufficient information to manage my health,

3= Actively managing my health,

4= Social support for health,

5= Appraisal of health information,

6= Ability to actively engage with healthcare providers,

7= Navigating the healthcare system,

8= Ability to find good health information,

9= Understanding health information well enough to know what to do

\*significant at  $p < 0.01$ ; \*\* $p < 0.05$ ; \*\*\* $p = 0.001$

**Discussion**

This is the first study to culturally adapt and evaluate the psychometric properties of the Yoruba-Health Literacy Questionnaire (Y-HLQ). The results suggest good reproduction of English HLQ in different language, culture and setting. The psychometric properties appeared to be good. The scales have different range of difficulty that should make Y-HLQ sensitive to changes over time. The scales that were hardest to score highly were: no. 8. 'Ability to find good health information' (0.81) and no. 7. 'Navigating the healthcare system' (0.81). This was similar to Danish and Chinese HLQ studies which found that the two scales showed the highest difficulties (11, 18). However, the difficulty levels

were higher in the present study compared with those studies. Item 7.1 'Find the right healthcare' (1.04) and item 8.2 'Find health information from several different places' (1.04) were the most difficult. The Nigeria healthcare system is weak and finding good healthcare services is rare, especially in rural setting. Therefore, the concept of finding right health or information might be a task and this may be a reason our participants find these items difficult.

The model fit for one-factor CFA for all scales was generally very good, demonstrating that the scales are homogeneous, although, with model modification for most part 1 scales. However, RMSEA, CFI and TLI values were within pre-specified cutoff for all models. Other HLQ translations found similar observation (6, 11, 12). Every

item clearly loaded on its own factor with exception of two out of 44 items which were  $< 0.4$ . This may suggest that the items in each scale captured the construct intended to measure (11). About 70% of factor loadings of original English HLQ were reproduced in Y-HLQ, which may suggest that it is psychometrically good as original version (6). Every scale has composite reliability and Cronbach's  $\alpha \geq 0.70$ , which suggests good reliability and internal consistency of Y-HLQ. These observations are in the range of English HLQ and other translation findings (6,11,12,19). Scale 5. 'Appraisal of health information' (0.70) has lowest values of composite reliability and Cronbach's  $\alpha$  which was observed by previous study (11).

Y-HLQ shows satisfactory discriminant validity, as none of the inter-factor correlations was  $\geq 0.8$  (12). The inter-factor correlations were higher in scales 6-9, which was consistent with previous studies (6, 11, 12). Our data suggests that Nigerian Yoruba speakers might view differently scales 6-9 compared with these studies (6, 11, 12).

The median test-retest reliability of Y-HLQ was good (ICC = 0.76), which might suggest that the scales show consistency in reproducing measured construct over time. ICC ranging between 0.75 and 0.9 have been suggested as good reliability for a measurement scale (20). However, scale 9. 'Understanding health information well enough to know what to do' (0.39) demonstrated poor reliability. While the reason for this observation is unclear, it may reflect poor health literacy among Nigerian rural dwellers where this study was conducted. Coupled with weakness of Nigerian healthcare system, most Nigerians who are economically and educationally poor may lack the understanding of what to do.

Our data showed correlation of age with some scales of Y-HLQ. Most of our participants are young adults and it is

reasonable to expect that their health literacy will be high. Studies have shown that young adults, compared with older people, demonstrate high health literacy (11, 21). Generally, sociodemographic characteristics (in term of age, gender, educational level, private residence or health insurance) have shown to correlate with health literacy (11, 21-23). While studies have shown a greater likelihood of lower health literacy in individuals with a chronic health condition, our data confirmed this (11, 22-24). This has been explained by higher health literacy needs of people managing a chronic illness, or low health literacy leading to chronic disease, or both (22).

This is the first study in low and middle-income country that translated and evaluated the psychometric property of HLQ using modern methods of determining psychometrics. It may address health inequality through improving access to healthcare among low and middle-income country. However, our study has some limitations. The participants in this study were from one community, as the HLQ - designed to measure health literacy in the population - may not be generalised to the entire community. Participants in this study were healthy individuals, with few of them suffering from chronic illnesses. There is the need to validate the Y-HLQ among people with specific chronic diseases. Despite these limitations, the results of this study are comparable with other HLQ translated studies (6, 11, 12, 19).

In conclusion, the study successfully translated and culturally adapted Y-HLQ. Y-HLQ demonstrated good content and construct validity and high composite reliability based on the results of the confirmatory factor analysis. The Y-HLQ is recommended for use in Nigerian healthcare delivery particularly among Yoruba speaking population in prevention of disease and to improve their health outcomes, improving

## communication between patients and clinicians and supporting health promotion planning.

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## Riassunto

### *Adattamento culturale e valutazione psicométrica della versione in lingua Yoruba del questionario sull'alfabetizzazione sanitaria*

**Premessa.** L'alfabetizzazione sanitaria è un importante concetto multidimensionale, impegnativo per la sanità pubblica, nonché un determinante dell'accesso alle prestazioni sanitarie e del loro esito, che quindi esige la possibilità di essere validamente misurata. Scopo della presente indagine è stato di adattare culturalmente la versione in lingua Yoruba del questionario sull'alfabetizzazione sanitaria e di stabilirne le proprietà psicometriche.

**Metodi.** Un'indagine trasversale sugli adulti nigeriani di lingua Yoruba è stata condotta con il detto questionario, tradotto e adattato culturalmente. I dati sono stati sottoposti a valutazione psicométrica (analisi del fattore confermativo, affidabilità composita, alpha di Cronbach, correlazione intra-classe) e all'associazione con le variabili sociodemografiche.

**Risultati.** Vi hanno partecipato 258 adulti con età media di 26,7 anni. La scala più facile per ottenere un punteggio elevato è stata "Gestire attivamente la mia salute" e la più difficile sono state "Capacità di trovare informazioni di buona salute" e "Navigare nel sistema sanitario". Sei modelli a un fattore si adattavano bene senza residui correlati, ma gli altri tre avevano un buon adattamento dopo la modifica del modello. Affidabilità composita e alpha di Cronbach di  $\geq 0,7$  sono state osservate per tutte le scale, suggerendo una buona consistenza

interna delle scale. L'affidabilità del test-retest della versione Yoruba del questionario è risultata da moderata a buona in tutte le scale, e la correlazione intra-classe compresa tra 0,66 e 0,76.

**Conclusioni.** Il questionario sull'alfabetizzazione sanitaria è stato tradotto con successo e adattato culturalmente alla lingua Yoruba, ed ha dimostrato di possedere un solido contenuto, una validità costruttiva ed un'alta affidabilità composita. La traduzione Yoruba del questionario ha dimostrato di essere un utile strumento clinico per la valutazione dell'alfabetizzazione sanitaria, in particolar modo per la comunità di lingua Yoruba della Nigeria, in tal modo contribuendo a migliorare i risultati di salute attraverso l'accesso all'assistenza sanitaria.

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