Original Article

Translation, Cross-Cultural Adaptation and Psychometric Evaluation of Multidimensional Fatigue Symptom Inventory – Short Form into Yoruba Language

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ABSTRACT

Objective: Validated multidimensional fatigue assessment instruments are few. Availability of the Multidimensional Fatigue Symptom Inventory-Short Form (MFSI-SF) in different linguistic and cultural contexts will promote its applicability. This study was aimed to translate, cross culturally adapt, and psychometrically evaluate the Yoruba version of MFSI-SF.

Methods: The translation of the MFSF-SF to Yoruba language followed standard guidelines of forward and back-translation, synthesis, expert review and pilot testing. Thereafter, 32 consenting stroke survivors participated in the psychometric evaluation of the Yoruba version of MFSF-SF for validation, while 15 of them participated in the test-retest. Descriptive statistics of mean and standard deviation, percentages and plots were used to summarize data. Inferential statistics of Pearson product-moment correlation, Spearman's rank correlation coefficient, One-way analysis of variance, T-test, Confidence Interval, Cronbach's alpha, Intraclass correlation coefficient, Confirmatory factor analysis were used. Alpha level was set at $p<0.05$.

Results: The mean age of the respondents was 56.5 years. The mean score for the subscales of MFSI-SF Yoruba version ranged from 5.81-13.0. The total MFSI-SF score was 15.6, while the skewness scores range from -0.133 to 1.157, only one subscale yielded negative skew. The divergent validity (-0.015-0.526), convergent validity (-0.341-0.446), known-group validity (no age/gender difference) were satisfactory. Confirmatory factor analysis indicates that all model fit for all subscales was good. The cronbach's alpha and Intraclass correlation coefficient ranged from 0.829 to 0.974 and from 0.708 to 0.949 respectively.

Conclusion: The Yoruba version of the MFSI-SF is satisfactory and psychometric sound to assess fatigue, especially among stroke survivors.

Keywords: Patient outcome; psychometrics; stroke; fatigue; Multidimensional Fatigue Symptom Inventory-Short Form

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INTRODUCTION

Fatigue is a common phenomenon in day to day physical therapy interventions.[1] Fatigue tends to interfere with activities of daily living, especially among patients with neuromuscular impairments, such as fibromyalgia,[2] rheumatic diseases,[3] and in stroke survivors.[4] Stroke survivors often experience post stroke fatigue which differs from normal fatigue.[5] Some studies have it to be a disease state accompanied by persistent exhaustion[6] and low productivity at activities of daily living. Fatigue is transient for healthy individual and this is as a result of physical or mental exertion.[7] Majority of people feels tired after break in circadian rhythm, engaging in strenuous activity, and exerting mental effort.

Objectifying the intensity of fatigue as it affects these patients require objective tools. There are several fatigue indicators

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which assess fatigue in different ways. Some are unidimensional, mainly with regard to fatigue intensity. This includes the Brief Fatigue Inventory (BFI),[8] Numerical Rating Scale,[9] Visual Analogue Scale (VAS)[10] and the Functional Assessment of Cancer Therapy-Fatigue. The Piper Fatigue Scale[11] and the Multidimensional Fatigue Inventory (MFI-20)[12] attempt to measure different dimensions of fatigue. Measuring fatigue is quite difficult owing to its subjective nature and how different people experience it, therefore the unidimensional fatigue measures like VAS, NRS, BFI cannot broadly measure fatigue owing to limitations on research and results and the fact that they tend to assess fatigue in one direction (general fatigue). The MFSI-SF approach fatigue measure based on five dimension, the fact that it is barely a new, easy-administer tool translated and adapted into few languages yet compared to other multidimensional fatigue measures makes MFSI-SF the best tool for fatigue assessment as it accommodates recent developments in fatigue construct.

Stein et al. developed a diverse, multidimensional instrument, the Multidimensional Fatigue Symptom Inventory (MFSI) that can be used to measure fatigue in cancer patients.[13] The MFSI originally assessed fatigue in five dimensions with 83 questions and Stein made amendments to it in 2004, shortening it to a 30-item questionnaire. The Multidimensional Fatigue Symptom Inventory – Short Form (MFSI-SF) has five subscales, each with six items: general fatigue, physical fatigue, emotional fatigue, mental fatigue and vigor.

The MFSI-SF has been widely used, as it has been translated into Chinese, Italian, German to quantify fatigue severity, but despite the acceptance of the MFSI-SF, its availability in many other local languages is limited. Translation of tools in local languages is reported to help facilitate comprehension and self-administration of such tool. Yoruba ethnic group is actually one of the largest in Nigeria even though English is the official language in this clime, huge majority still struggle with its comprehension. Availability of a Yoruba version of the MFSI-SF will allow for increased utilization of the tool and objectivity in assessment of fatigue severity among indigenous patients based on a globally accepted outcome measure. Therefore, the aim of this study was to translate and cross-cultural adapt the English version of the MFSI-SF into Yoruba language, as well as to examine its psychometric properties among stroke survivors.

MATERIALS AND METHOD

Respondents for this correlation study were stroke survivors who were attending the Physiotherapy, Occupational Therapy and Medical Outpatient Departments at the Obafemi Awolowo University Teaching Hospital Complex (OAUTHC), Ile-Ife, Osun State, Nigeria. Excluded from the study were stroke survivors who were not literate in English and Yoruba languages, as well as those with drug history that alters central nervous system and cognitive impairment. Sample size for this study was determined using the formula - $N = z^2pq / d^2$,[14] where -N = the desired sample size (when population is greater than 10,000), Z = 1.96 at 95% confidence interval, p = pre-study estimate of proportion, q = 1 -p = 0.05, d = absolute standard error = 0.05. $n = (1.96)^2 (0.134) (0.5) / (0.05)^2 = 103$ respondents.

Thus, a total of 113 respondents were estimated to participate in this study by adding 10% of the calculated sample size. The sample size was adjusted by using the formula for population less than 10,000, n = n/ 1+n/N, Where n = adjusted sample size, n = calculated sample size, N = total population of stroke survivors present at the facility is 47. Hence, n = 103/1 + (103/47); n = 32. A total of 32 were therefore recruited into the study.

Instrument

The following instruments were used in this study:

The English version of the MFSI-SF - Short Form (MFSI-SF) is a 30-item measure of fatigue with five subscales (general fatigue, physical fatigue, emotional fatigue, mental fatigue and vigor), each with six items. The MFSI-SF can be completed in a wide variety of settings in about 5 minutes. Items are rated on a 5-point scale indicating how true each statement was for the respondent during the last week (0 = Not all; 1 = A little; 2 = Moderately; 3 = Quite a bit; 4 = Extremely). Scoring instructions for the MFSI-SF are as follows: General scale score = sum of items 10, 12, 14, 17, 18, and 28; Physical scale score = sum of items 2, 4, 6, 16, 19, and 26; Emotional scale score = sum of items 3, 8, 13, 21, 23, and 30; Mental scale score = sum of items 1, 11, 15, 20, 25, and 27; Vigor scale score = sum of items 5, 7, 9, 22, 24, and 29; and Total scale score = sum of scales 1-4 minus the Vigor scale score.

The translated Yoruba version of the MFSI-SF is a 30-item measure of fatigue with five subscales just like the English version (see appendix).

The Yoruba version of Visual Analogue Scale (VAS) is a tool that measures a characteristic or attitude that is believed to range across a continuum of values and cannot easily be directly measured such as intensity or frequency of various symptoms like fatigue and pain. The Yoruba version of SF-12 is a self-reported outcome measure assessing the impact of health on an individual's everyday life. It is often used as a quality of life measure.

Procedure

The author of MFSI-SF was contacted for approval. The English version of the MFSI-SF was translated to Yoruba version involving 5 steps:

Forward Translation of the Multidimensional Fatigue

Symptom Inventory- Short Form: Two forward translators who are native speakers of Yoruba language with high level proficiency in English translated the MFSI-SF from English to Yoruba language.

Synthesis: A different bilingual translator synthesized the two forward translations T1 & T2 into one (T12).

Backward Translation of the Multidimensional Fatigue Symptom Inventory- Short Form: Two backward translators who are native speakers of the English language with a good proficiency in Yoruba language translated the synthesized version of the MFSI-SF back to English version of the questionnaire.

Expert Committee Review: MFSI-SF-T, a pre-final Yoruba version of the MFSI-SF for field testing was created by the researcher and all four translators. Ambiguity or inconsistency in previous stages of the translation process was reviewed and analyzed by the committee. They also assessed the text and made required adjustments to ensure consistency and suitability for Yoruba citizens in general.

Pilot testing: A pilot test was conducted by administering the pre-final version to 10 Yoruba speakers, essence was to garner perception, interpretation, and understanding of the questionnaire and to make necessary adjustment where needed.

The translated Yoruba MFSI-SF had the same grouping and ordering of items as the English MFSI-SF. However, several portions of the questionnaire were rearranged and reworded to make the Yoruba MFSI-SF conceptually equivalent to the English MFSI-SF. To the translated Yoruba MFSI-SF, the following cultural adjustments were made:

The translated Yoruba MFSI-SF has an alphabetical numbering system that differs from the English version as the letter 'C' does not exist in Yoruba alphabets, and alphabets such as " and 'GB' do not exist in English alphabets, the alphabetic numbering had to be changed. As a result, 'd' is the third Yoruba alphabet and 'gb' is the eighth, resulting in an alphabetic numbering change in the translated Yoruba MFSI-SF. The Yoruba version of the questionnaire was administered to the respondents twice, while that of English once, after the first administration of the Yoruba version. Essence of this was to know the reliability of the Yoruba version and validity of the English version. A total of 32 respondents (11 males and 21 females) participated in the study while 15 of them came for the test-retest reliability of the Yoruba version of the MFSI-SF. Respondents completed both English and Yoruba versions of MFSI-SF as well as questions on socio-demographic variables. Ethical approval was obtained from the ethical review committee, Health Research and Ethics Committee of the Obafemi Awolowo University Teaching Hospital Complex, Ile-Ife, Nigeria. In addition, informed written consent was obtained from the respondents.

Data Analysis

Mean score, confidence interval, skewness, and Kurtosis were used to produce descriptive statistics of scales in the Yoruba version of the MFSI-SF. The convergent and divergent validity of Yoruba version of the MFSI-SF was determined by using Spearman's rank correlation coefficient and Pearson's product moment correlation respectively. The Yoruba version of the MFSI-SF was assessed for known-groups validity by comparing scale scores by gender and age groups using an independent t-test and a one-way ANOVA, respectively. The Yoruba MFSI-SF's reliability (test-retest) was determined using Pearson's product moment and scattered plot. SPSS (Statistical Package for Social Sciences) version 26 was used to analyze the data. Alpha level was set at $p < 0.05$.

RESULTS

The mean age, weight, height, and body mass index of the respondents were 56.5±7.23 years, 67.4±8.88 Kg, 1.6±0.12 m, 25.3±4.12 Kg/m^2 respectively. Table 1 shows the mean, confidence interval, skewness, and Kurtosis of mean scores for the Yoruba version of Multidimensional Fatigue Symptom Inventory-Short Form (MFSI-SF**)** five subscales and Total Scale Score (TSS). The mean scores for the subscales range

Table 1: Frequencies of Yoruba version of the Multidimensional Fatigue Symptom Inventory-Short Form

Scale	General Scale Score	Physical Scale Score	Emotional Scale Score	Mental Scale Score	Vigor Scale Score	Total Scale Score
N	32	32	32	32	32	32
Mean	8.16	8.25	5.81	6.34	13.0	15.6
Std. Deviation	4.55	3.13	3.82	4.06	3.75	16.6
Skewness	0.415	-0.133	0.867	1.157	0.227	0.669
Std. Error of Skewness	0.414	0.414	0.414	0.414	0.414	0.414
Kurtosis	0.273	1.137	0.004	1.924	0.27	1.047
Std. Error of Kurtosis	0.809	0.809	0.809	0.809	0.809	0.809
Minimum	0.00	0.00	1.00	0.00	5.00	-16.00
Maximum	18.00	14.00	15.00	18.00	21.00	57.00

Table 2: Divergent and Convergent validity of the Yoruba version of the Multidimensional Fatigue Symptom Inventory-Short Form using the SF-12 questionnaire and Visual Analogue Scale

Scale	General Scale Score r(ρ)	Physical Scale Score r(ρ)	Emotional Scale Score r(ρ)	Mental Scale Score r(ρ)	Vigor Scale Score r(ρ)	Total Scale Score r(ρ)
Divergent Validity (SF 12)						
PF	-0.619(0.001)	-0.489(0.005)	-0.233(0.199)	-0.364(0.40)	0.526(0.002)	
RLP	0.498(0.004)	0.368(0.038) [b]	0.283(0.117)	0.316(0.079)	-0.486(0.005)	
RLE	0.441(0.011) [b]	0.409(0.020) [b]	0.212(0.244)	0.135(0.462)	-0.319(0.075)	
SF	0.208(0.254)	0.366(0.039) [b]	-0.031(0.865)	-0.103(0.577)	-0.019(0.919)	
HP	-0.148(0.419)	-0.213(0.241)	-0.057(0.756)	-0.207(0.256)	0.230(0.205)	
MH	-0.055(0.766)	-0.251(0.166)	-0.411(0.019) [b]	-0.334(0.062)	0.134(0.466)	
BP	0.118(0.519)	-0.015(0.934)	0.198(0.277)	0.045(0.806)	-0.156(0.394)	
VT	-0.287(0.111)	-0.127(0.487)	-0.108(0.557)	-0.197(0.279)	0.334(0.062)	
Domain						
PHD						-0.240(0.185)
MHD						-0.169(0.356)
Convergent Validity (VAS)						
VAS	0.447(0.010) [b]	0.351(0.049) [b]	0.319(0.075)	0.405(0.022) [b]	-0.341(0.056)	0.466(0.007)

Unmarked at the 0.05 level correlations were not significant;

[b]Correlation was significant at the 0.05 level (2 tailed).

Key: Scales; physical functioning (PF), role limitations due to physical problems (RLP), bodily pain (BP), general health (GH), vitality (VT), social functioning (SF), role limitations due to emotional problems (RLE), and mental health (MH). Domains; physical health component (PHD); mental health components (MHD); visual analogue scale (VAS)

from 5.81 to 13.0, with the Vigor Scale Score (13.0) and Emotional Scale Score (ESS) (5.81) being the highest and lowest respectively. The mean TSS of the MFSI-SF was 15.6 ± 16.6. The Yoruba version of the MFSI-SF subscale scores skewness range from -0.133 to 1.157, with only the Physical Scale Score (PSS) scale yielding negative skewness.

The result of divergent and convergent validity of the MFSI-SF using the SF-12 survey and visual analogue scale is presented in Table 2. Using the Pearson Correlation analysis, the correlation coefficient (r) between the subscales (dimensions) and the TSS ranges from -0.015 to 0.526, with VSS(0.526) and PSS(-0.015) being the highest and lowest respectively. There were significant correlations between the Physical Scale Score (PSS) and SF-12 Role Limitation owing to Physical problems (RLP) 0.368(0.038), General Scale Score (GSS) and SF-12 Role Limitation owing to Emotional problems (RLE) 0.441(0.011), PSS and RLE 0.409(0.020), PSS and SF-12 Social Function 0.366(0.039), and ESS and SF-12 Mental Health 0.411(0.019) subscales. The results of the convergent validity of the Yoruba version of the MFSI-SF using the Visual Analogue Scale (VAS) show that the correlation coefficient (r) between the subscales (dimensions) and the TSS ranges from -0.341 to 0.466, with TSS (0.466) and VSS (-0.341) being the highest and lowest respectively. There were significant correlations between VAS and each of GSS 0.447 (0.010), PSS 0.351 (0.049), and Mental Scale Score (MSS) 0.405 (0.022).

Confirmatory factor analysis for the Yoruba version of the MFSI-SF is presented in Table 3. From the result, 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 three scales (physical, emotional and vigor) while other two were not. However, after model modification, the model fit for other two scales were perfectly fit after including correlation residuals (maximum 2) ranged from 0.16 (general and mental scales) to 0.33 (general scale). The factor loading for general scale was satisfactory while most factor loadings for mental and emotional scales were also satisfactory. However, the factor loading for physical scale was not satisfactory. The 5-factor model did not return satisfactory model fits. All the scales demonstrated acceptable composite reliability ranged from 0.62 to 0.85 indicating internal consistency of the instrument.

Table 4 shows the known-groups validity of the Yoruba version of the MFSI-SF with gender. Independent t-test comparison of subscales and TSS by gender showed that there were no significant differences in all subscales and TSS mean scores ($p > 0.05$). Also, the results of the One-way ANOVA analysis of subscales and TSS by age group are shown in Table 5. The mean scores of the Yoruba version of the MSFI-SF subscales and TSS did not differ significantly across the age groups ($p > 0.05$). Cronbach's alpha coefficient (α) and Intra-Class Correlation (ICC) coefficient were used to assess the internal consistency of the Yoruba version MFSI-SF (Table 6). The results show that there were acceptable internal consistency ($\alpha = 0.829$ to 0.974) across the subscales, based

Table 3: Factor Analysis of the Multidimensional Fatigue Symptom Inventory-Short Form Yoruba version

Item	Factor loading	R^2	Composite reliability
General scale			0.853
10. I feel pooped	0.575	0.330	
12. I am worn out	0.856	0.732	
14. I feel fatigued	0.803	0.645	
17. I feel sluggish	0.536	0.287	
18. I feel run down	0.657	0.432	
28. I feel tired	0.748	0.560	
Model fit - χ^2(ML) =5.957 , p= 0.545, TLI=1.027 , CFI= 1.000, RMSEA=0.000 (0.000 – 0.200)			
Physical scale			0.619
2. My muscles ache	0.065	0.004	
4. My legs feel weak	0.283	0.080	
6. My head feels heavy	0.217	0.047	
16. My arms feel weak	0.335	0.112	
19. I ache all over	1.326	1.758	
26. My body feels heavy all over	0.296	0.088	
Model fit - χ^2(ML) =2.879 , p= 0.896, TLI=1.479 , CFI= 1.000, RMSEA=0.000 (0.000 – 0.098)			
Emotional scale			0.726
3. I feel upset	0.040	0.002	
8. I feel nervous	0.768	0.590	
13. I feel sad	0.612	0.374	
21. I feel depressed	0.721	0.519	
23. I feel tense	0.174	0.030	
30. I am distressed	0.844	0.712	
Model fit - χ^2(ML) =4.910 , p= 0.842, TLI=1.190 , CFI= 1.000, RMSEA=0.000 (0.000 – 0.116)			
Mental scale			0.822
1. I have trouble remembering things	0.371	0.138	
11. I am confused	0.469	0.220	
15. I have trouble paying attention	0.748	0.560	
20. I am unable to concentrate	0.894	0.799	
25. I make more mistakes than usual	0.627	0.394	
27. I am forgetful	0.781	0.611	
Model fit - χ^2(ML) =3.055 , p= 0.880, TLI=1.133 , CFI= 1.000, RMSEA=0.000 (0.000 – 0.108)			
Vigor scale			0.719
5. I feel cheerful	0.451	0.203	
7. I feel lively	0.625	0.390	
9. I feel relaxed	0.832	0.692	
22. I feel refreshed	0.334	0.112	
24. I feel energetic	0.434	0.188	
29. I feel calm	0.563	0.316	
Model fit - χ^2(ML) =10.556 , p= 0.307, TLI=0.903 , CFI= 0.942, RMSEA=0.075 (0.000 – 0.224)			

on a consistency score of more than 0.7 which was considered satisfactory. The ICC of the Yoruba version MFSI-SF ranges from 0.708 to 0.949.

Table 7 shows the item-subscale correlations for the Yoruba MFSI-SF was done in order to detect problematic or inconsistent items. Acceptable item-to-subscale correlation coefficient ranges from (r = -0.436 to 0.932). There were few significant item-subscale correlations for the Yoruba version of the MFSI-SF, however the corrected item-subscale score showed a satisfactory correlation as $r > 0.30$ for all items, subtraction of each item score from the corresponding subscale total score (Chan *et al.,* 2018). Table 8 shows the correlation coefficient (r) of scores on the Yoruba MFSI-SF on two occasions (test-retest reliability) among 15 respondents only. The r for subscales is between 0.907 and 0.981, while the total is 0.986. There were significant correlation between VSS

Table 4: Known group validity of the Yoruba version of the Multidimensional Fatigue Symptom Inventory-Short Form by gender

Scale	Male	Female	t-cal	ρ-value
	$\bar{x}$ ± SD (n = 11)	$\bar{x}$ ± SD (n = 21)		
General Scale Score	8.64±5.02	7.90±4.40	0.425	0.674
Physical Scale Score	8.27±4.36	8.23±2.38	0.029	0.977
Emotional Scale Score	6.55±4.18	5.42±3.66	0.780	0.441
Mental Scale Score	7.00±4.75	6.00±3.74	0.654	0.518
Vigor Scale Score	11.9±13.6	13.6±4.14	-1.199	0.240
Total Scale Score	18.5±18.4	14.0±15.9	0.728	0.472

*indicate significance at ρ<0.05

Table 5: Known group validity of the Yoruba version of the Multidimensional Fatigue Symptom Inventory-Short Form by age

Scale	Age Group			F-value	ρ-value
	<50 years	51-60 years	61-70 years		
	$\bar{x}$ + SD	$\bar{x}$ + SD	$\bar{x}$ + SD		
General scale score	7.00±3.61	8.27±3.75	8.80±6.29	0.315	0.732
Physical scale score	8.00±4.20	7.87±2.59	9.00±1.03	0.405	0.670
Emotional scale score	5.71±3.04	5.67±3.15	6.10±5.34	0.039	0.962
Mental scale score	5.71±3.20	5.73±3.17	7.70±5.62	0.798	0.460
Vigor scale score	13.4±3.31	13.1±2.47	12.5±5.58	0.136	0.873
Total scale score	13.0±15.4	14.4±11.4	19.1±23.9	0.330	0.721

Key: $\bar{x}$, mean; SD: Standard Deviation.

Table 6: Cronbach's alpha & Intra class Correlation of the Yoruba version of the Multidimensional Fatigue Symptom Inventory-Short Form

Scale	Cronbach α	ICC	95% Confidence Interval		ρ-value
			Lower Bound	Upper Bound	
General Scale Score	0.908	0.832	0.684	0.914	0.001
Physical Scale Score	0.877	0.782	0.599	0.887	0.001
Emotional Scale Score	0.942	0.891	0.788	0.945	0.001
Mental Scale Score	0.974	0.949	0.898	0.975	0.001
Vigor Scale Score	0.829	0.708	0.481	0.846	0.001
Total Scale Score	0.961	0.925	0.852	0.963	0.001

Keys: Alpha level was set at 0.05.

and GSS -0.562(0.029), PSS -0.518(0.048), MSS -0.532(0.04), and PSS and VSS -0.520(0.047).

DISCUSSION

The study was aimed to translate and cross-culturally adapt Multidimensional Fatigue Symptom Inventory Short-Form (MFSI-SF) into Yoruba language, and determine the validity and reliability of the translated Yoruba version. The translation of the MFSI-SF followed Beaton et al. [15] translation guideline which consist of two forward translations of the English version to Yoruba version, synthesis of the forward translations into one, two backward translations of the synthesized version to English version, expert committee review by the researcher and all four translators, and lastly pilot testing with the pre-final version developed by the expert committee. The instrument has primarily been utilized with cancer patients, but findings have also been reported for patients with other health issues (e.g., osteoarthritis and fibromyalgia) and for people who have no known health conditions. In the psychometric testing of the Yoruba version of the MFSI-SF, 32 Stroke survivors who were aged 56.5 ± 7.23 years participated. Typically, stroke is frequent in this age range, with the risk increasing with age, with the incidence doubling every decade beyond the age of 45, and over 70% of all strokes occurring after the age of 65. [16]

Divergent validity of the Yoruba version of MFSI-SF using the SF-12 survey was evaluated for construct validity to see if the SF-12 subscales and domain scores would be poorly correlated with MFSI-SF scores because they are totally

Table 7: Item-scale correlation of the Yoruba version of the Multidimensional Fatigue Symptom Inventory-Short Form

Item	General Scale Score r(ρ)	Physical Scale Score r(ρ)	Emotional Scale Score r(ρ)	Mental Scale Score r(ρ)	Vigor Scale Score r(ρ)	Total Scale Score r(ρ)
Item 1	0.209(0.108)	0.059(0.750)	0.345(0.053)	0.586(0.001) [b]	-0.391(0.027) *	0.401(0.023) *
Item 2	0.356(0.046) *	0.515(0.003) [b]	0.496(0.004)	0.494(0.004)	-0.010(0.957)	0.431(0.014) *
Item 3	-0.049(0.789)	0.207(0.255)	0.195(0.284) [b]	-0.076(0.679)	0.054(0.768)	0.040(0.830)
Item 4	0.173(0.345)	0.492(0.004) [b]	0.060(0.744)	0.105(0.568)	-0.105(0.568)	0.203(0.265)
Item 5	-0.635(0.001)	-0.480(0.005)	-0.458(0.008)	-0.544(0.001)	0.612(0.001) [b]	-0.640(0.001)
Item 6	0.405(0.022) *	0.514(0.003) [b]	0.374(0.035) *	0.254(0.161)	-0.274(0.129)	0.417(0.018) *
Item 7	-0.490(0.004)	-0.300(0.095)	-0.368(0.038) *	-0.386(0.029) *	0.695(0.001) [b]	-0.526(0.002)
Item 8	0.736(0.001)	0.614(0.001)	0.801(0.001) [b]	0.724(0.001)	-0.543(0.001)	0.800(0.001)
Item 9	-0.511(0.003)	-0.252(0.163)	-0.285(0.114)	-0.377(0.034) *	0.755(0.001) [b]	-0.515(0.003)
Item 10	0.661(0.001) [b]	0.311(0.083)	0.515(0.003)	0.573(0.001)	-0.658(0.001)	0.646(0.001)
Item 11	0.515(0.003)	0.480(0.005)	0.530(0.002)	0.645(0.001) [b]	-0.449(0.001)	0.612(0.001)
Item 12	0.848(0.001) [b]	0.554(0.001)	0.505(0.003)	0.596(0.001)	-0.724(0.001)	0.761(0.001)
Item 13	0.584(0.001)	0.518(0.002)	0.711(0.001) [b]	0.598(0.001)	-0.421(0.016) *	0.662(0.001)
Item 14	0.820(0.001) [b]	0.678(0.001)	0.804(0.001)	0.719(0.001)	-0.671(0.001)	0.864(0.001)
Item 15	0.705(0.001)	0.480(0.005)	0.542(0.001)	0.721(0.001) [b]	-0.657(0.001)	0.732(0.001)
Item 16	0.581(0.001)	0.689(0.001) [b]	0.371(0.037) *	0.386(0.029) *	-0.353(0.047) *	0.548(0.001)
Item 17	0.722(0.001) [b]	0.619(0.001)	0.509(0.003)	0.595(0.001)	-0.294(0.102)	0.643(0.001)
Item 18	0.771(0.001) [b]	0.712(0.001)	0.474(0.006)	0.405(0.022) *	-0.305(0.090)	0.621(0.001)
Item 19	0.635(0.001)	0.733(0.001) [b]	0.456(0.009)	0.507(0.003)	-0.342(0.056)	0.617(0.001)
Item 20	0.669(0.001)	0.593(0.001)	0.798(0.001)	0.865(0.001) [b]	-0.547(0.001)	0.812(0.001)
Item 21	0.497(0.004)	0.493(0.006)	0.816(0.001) [b]	0.739(0.001)	-0.350(0.050) *	0.672(0.001)
Item 22	-0.209(0.251)	-0.184(0.313)	-0.436(0.013) *	-0.365(0.040) *	0.572(0.001) [b]	-0.410(0.020) *
Item 23	0.280(0.121)	0.114(0.535)	0.337(0.060) [b]	0.246(0.174)	-0.258(0.154)	0.294(0.103)
Item 24	-0.267(0.139)	-0.104(0.573)	0.010(0.956)	-0.144(0.433)	0.487(0.005) [b]	-0.235(0.195)
Item 25	0.519(0.002)	0.381(0.032) *	0.656(0.001)	0.652(0.001) [b]	-0.248(0.171)	0.580(0.001)
Item 26	0.559(0.001)	0.537(0.002) [b]	0.595(0.001)	0.932(0.027) *	-0.341(0.056)	0.563(0.001)
Item 27	0.564(0.001)	0.551(0.001)	0.730(0.001)	0.831(0.001) [b]	-0.328(0.067)	0.703(0.001)
Item 28	0.784(0.001) [b]	0.616(0.001)	0.656(0.001)	0.668(0.001)	-0.554(0.001)	0.769(0.001)
Item 29	-0.489(0.005)	-0.206(0.258)	-0.429(0.014) *	-0.506(0.003)	0.688(0.001) [b]	-0.550(0.001)
Item 30	0.627(0.001)	0.433(0.013) *	0.797(0.001) [b]	0.729(0.001)	-0.466(0.007)	0.719(0.001)

All correlations were significant at the 0.05 level (two tailed)
All items had satisfactory item-to-domain correlation (defined by a corrected r>0.300)
[b]The corrected item-to-domain correlation was calculated for each item by removing the contribution of the item's score to its corresponding subscale score

Table 8: Test-retest of the Yoruba Version of the Multidimensional Fatigue Symptom Inventory-Short Form

Scale	Retest					
	General Scale Score r(ρ)	Physical Scale Score r(ρ)	Emotional Scale Score r(ρ)	Mental Scale Score r(ρ)	Vigor Scale Score r(ρ)	Total Scale Score r(ρ)
General Scale Score	0.981(0.001)	0.820(0.001)	0.758(0.001)	0.778(0.001)	-0.562(0.029) *	0.906(0.001)
Physical Scale Score	0.866(0.001)	0.919(0.001)	0.682(0.005)	0.738(0.002)	-0.518(0.048) *	0.859(0.001)
Emotional Scale Score	0.677(0.006)	0.687(0.005)	0.943(0.001)	0.920(0.001)	-0.477(0.072)	0.865(0.001)
Mental Scale Score	0.775(0.001)	0.765(0.001)	0.919(0.001)	0.970(0.001)	-0.532(0.041) *	0.923(0.001)
Vigor Scale Score	-0.683(0.005)	-0.520(0.047) *	-0.720(0.002)	-0.648(0.009)	0.907(0.001)	-0.768(0.001)
Total Scale Score	0.911(0.001)	0.852(0.001)	0.919(0.001)	0.931(0.001)	-0.659(0.007)	0.986(0.001)

unrelated. We predicted that the MFSI-SF score would have a non-correlation with SF-12. The correlation coefficient (r) between the subscales (dimensions) and the TSS ranges from -0.015 to 0.526, with VSS (0.526) and PSS (-0.015) being the highest and lowest respectively. There were few significant correlations. The results of SF-12 Vitality (energy/fatigue) with general (-0.287), physical (-0.127), emotional (-0.108), mental (-0.197), vigor 0.334(0.062) subscales of Yoruba MFSI-SF are consistent with the earlier findings.[17] Total Scale Score of Yoruba MFSI-SF with SF-12 physical (-0.240), SF-12 mental (-0.169) are poorly correlated. The model fit of all Yoruba MFSI-SF was good indicating homogenous scales. Also, in line with original version, Yoruba MSFI-SF was loaded satisfactory into 3 factors. However, the 5-factor model did not return satisfactory model fits. Factor analysis is a type of construct validation that aids in the exploration of patterns of correlations between items or the confirmation of the MFSI-SF factor structure. The lack of model fit for the 5-factor in Yoruba MFSI-SF is similar to the results of Yang et al. while translating MSFI-SF into Chinese and they attributed the discrepancy to differences in culture and population groups.[18]

Convergent validity was evaluated to see that VAS fatigue and MFSI-SF as they are actually related as they measure common constructs (fatigue). The correlation coefficient (r) between the subscales (dimensions) and the TSS ranges from -0.341 to 0.466, with TSS (0.466) and VSS (-0.341) being the highest and lowest respectively, There were significant correlations between VAS and general, physical, mental subscales of the Yoruba MFSI-SF, but poor correlation was observed for the emotional and vigor subscales, i.e. emotional and vigor subscales did not have measurement equivalence, this follow suit with a previous study that reported significant correlation. [19] The results of a test of the Yoruba MFSI-SF's known-group validity revealed that its dimensions are unaffected by socio-demographic characteristics such as age and gender, since no significant differences were found for both age and gender groups. This finding is in line with previous research that revealed a limited link between gender and age and fatigue in other chronic populations, such as osteoarthritis patients. [20]

In the reliability testing, MFSI-SF also showed good internal consistency. The cronbach's alpha (α) ranges 0.829 to 0.974 across the subscales, The ICC ranges from 0.708 to 0.949. This is consistent with prior validation tests in the United States for the English and Chinese versions of MFSI-SF, which yielded a score of $\alpha > 0.7$ and this was considered satisfactory. [17, 18] In previous studies, the MFSI-SF measurements have mean Cronbach's alpha coefficients ranging from 0.83 to 0.93, showing strong internal consistency. [17, 18] Despite the fact that all values were adequate, the Yoruba version reported poorer internal consistency than the English version in two domains (α = 0.829 to 0.974 vs. 0.889 to 0.944) Patients frequently asked researchers to explain the meaning of "pooped" during data collection since they did not comprehend the phrase. The MFSI-SF was created in the United States, and challenges with cross-cultural adaption may explain the instrument's failure to recognize slang phrases like "pooped." Furthermore, the study's older adult patient sample (56.5 ± 7.23 years old) may contribute to a reduced understanding of slang phrases by being less exposed to foreign culture through popular media than the younger population. All of these factors could contribute to a reduced item-to-scale correlation. As a result, possible changes to item 10 could be made to improve the tool's psychometric qualities.

While limited tools exist to measure fatigue compared with other health indicators, the existing fatigues tools like MFSI-SF have limited availability, owing to not being obtainable in many local languages. Hence, the need for the translation of the MFSI-SF to local languages. MFSI-SF was used to assess fatigue levels in a variety of patient populations, and the results showed good reliability and validity. An availability of the MFSI-SF in Yoruba language may enhance the uptake of the tool, which in turn will reflect in objective assessment of fatigue in patients, especially those with stroke in this setting. The translation, validation, and adaptation of the Yoruba version of the MFSI-SF have shown that it has psychometric features that are acceptable by standards, and it is recommended for assessing patients with fatigue in the Yoruba population. Future research into the validity and reliability of the tool is also necessary.

CONCLUSION

The Yoruba version of the MFSI-SF has adequate data quality, constructs validity (convergent, divergent, known-group, and factor analysis), reliability, and internal consistency, and is recommended for evaluating fatigue in the Yoruba community.

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