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The Igbo version of the Global Physical Activity Questionnaire (GPAQ)- A cross-cultural adaptation study

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Abstract

Background Physical activity (PA) plays a critical role in preventing non-communicable diseases, and maintaining the overall health and well-being of adults. PA surveillance has become a global concern leading to the development of numerous surveys for its measurement. Global Physical Activity Questionnaire (GPAQ) merges the advantages of both the short and long versions of the International Physical Activity Questionnaire (IPAQ) by incorporating various domains (work, transport, and leisure time), while still maintaining a significantly shorter length. This study aimed to cross-culturally adapt the original English version of GPAQ to the Igbo culture and environment.

Methods The original version of GPAQ (GPAQ) was translated, synthesized, back-translated, and subjected to expert panel review before producing the final Igbo version of the GPAQ (GPAQ-I). The GPAQ and GPAQ-I were administered to 155 community-dwelling adults (36.1% males and 63.9% females) living in Nnewi who were recruited consecutively. The data obtained was analyzed using frequency counts, percentages, mean, standard deviations, Spearman rank order test, and Mann-Whitney U test with *p*-value set at 0.05.

Results There was no significant difference in the scores on the English and Igbo versions of the GPAQ ($p < 0.001$). The correlations between the corresponding domains and total scores on both versions of the GPAQ (rho = 1.0) showed excellent concurrent agreement.

Conclusion The successfully adapted GPAQ-I demonstrated a strong agreement with the original English version. Further psychometric testing is required to fully establish its internal consistency, reliability, and validity.

Keywords Cross-cultural adaptation, Translation, Global physical activity questionnaire (GPAQ), Igbo language and culture

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Background of the study

Non-communicable diseases (NCDs) have become a major global health concern, particularly among the adult population [1]. According to the Nigerian National NCDs survey, cardiovascular diseases, diabetes, and cancer account for a significant portion of the NCDs burden in the country, and the main risk factors contributing to NCDs involve unhealthy diets, physical inactivity, [2] tobacco use, and alcohol misuse, hence, most of these diseases are preventable as they eventually progress in early life due to lifestyle aspects [1, 3].

Physical activity (PA) defined as any bodily movement produced by skeletal muscles that results in energy expenditure [4] plays a critical role in preventing NCDs, especially cardiovascular diseases, which pose a significant threat to adults' health as engaging in regular exercise helps lower blood pressure, reduce cholesterol levels, and enhance overall cardiovascular function [5]. Beyond NCD prevention, PA is fundamental to maintaining overall health and well-being among adults. Regular exercise supports healthy weight management and helps reduce the risk of obesity; a condition associated with numerous health issues. It also aids in maintaining muscle strength and bone density, combating the age-related decline in these critical aspects of physical health [6].

A significant aspect of adulthood is the age-related decline in PA levels, a phenomenon commonly observed in individuals aged 18 and above [7–10]. This decline impacts the health and quality of life of adults as they tend to engage in less exercise and movement with advancing age. Factors contributing to this reduced PA include sarcopenia, joint stiffness, mobility issues, changes in hormonal levels, fear of injury, and psychological and emotional factors [11]. In addition to the aforementioned health-related barriers, lack of social support to be active, lower preference for PA, lower enjoyment of PA and lower confidence in their ability to engage in PA regularly have been reported by apparently healthy adults as barriers to the PA [12–14].

With the increasing population of adults, the WHO has recognized the importance of PA as a health-enhancing behaviour and has promoted the assessment of PA in global surveillance. Numerous surveys have been created on a global scale, with the majority originating from high-income countries and a few from low-income and middle-income nations like India (Bharathi et al., 2006 as cited in Mathews et al., 2016). Relating to PA the commonest specific measures in no order are the International Physical Activity Questionnaire (IPAQ), Global Physical Activity Questionnaire (GPAQ), Physical Activity Scale for the Elderly (PASE), Godin-Shephard Leisure-Time Exercise Questionnaire, Stanford Brief Activity Survey (SBAS), New Zealand physical activity questionnaire (NZPAQ) [15–17]. The utilization of diverse questionnaires to evaluate PA in various settings has resulted in inconsistent and challenging comparisons of findings [18]. To address these intercountry and within-country disparities in PA assessment, the World Health Organization (WHO) formulated the GPAQ which evaluates PA across multiple domains, including work, travel, and leisure and has gained widespread adoption worldwide [19, 20].

Cross-cultural adaptation of validated outcome instruments has been advocated to facilitate their use in international multicentre clinical trials, [21] which would also reduce the need for developing new instruments with the same purpose. GPAQ has been shown to possess the ability to be successfully translated and cross-culturally adapted in different languages such as Bahasa Melayu (Indonesia), Bengali, French, Greece, Hungarian, Indian, Polish, Punjabi, and Turkish [20, 22–29].

The GPAQ has not been translated or validated in any Nigerian language. This could pose a challenge when using the tool on Nigerians who have limited or no knowledge of the English language, as it would require individual translation by healthcare professionals. Nigeria is a diverse country with over 500 indigenous languages, and the Igbo language is one of the three major languages spoken by Nigerians, particularly in the Southeast region [30–32]. The Igbo-speaking population constitutes a significant portion of Nigeria's total population, making up approximately 24% of 177 million people, which is around 42 million individuals [33]. Given this linguistic diversity and the importance of making the GPAQ accessible to the general population, this study aimed to adapt the GPAQ specifically for use among Igbo-speaking adults cross-culturally.

Materials and methods

Study design

This present study was a cross-cultural adaptation conducted among community-dwelling adults aged 18 years and above in Nnewi, Anambra state, Nigeria at the time of the study. Nnewi is the only town in Nnewi North local government, which is one of the 21 local government areas in Anambra state. It constitutes four major quarters namely: Umudim, Otolo, Uruagu, and Nnewi-ichi. It is the second largest and second most populated city in Anambra state located in the southern part of the state. This study consecutively recruited 155 adults and only adults aged 18 years and above resident in Nnewi at the time of the study, those who can understand both English and Igbo languages were included physically from the various points of contact in the community (churches, marketplaces, residents, social gatherings, and workplaces, while adults aged 18 years and above with communication impairments were excluded from the study. The minimum sample size was calculated using G

power version 3.0; A sample size of 155 has a 90% power to detect a moderate change of 0.3 at an alpha level of 0.05 [34].

Study instruments

Global Physical Activity Questionnaire (GPAQ)-version 2

The Global Physical Activity Questionnaire is an interviewer-administered instrument that is used to assess the frequency and duration of an individual's PA level in a typical week. It distinguishes PA duration by minutes/day and minutes/week for each PA domain, which allows for calculating the energy expenditure scored in metabolic equivalent tasks (METs). One MET corresponds to resting energy expenditure. GPAQ is a 16-item questionnaire that collects information on PA participation in three settings (or domains) as well as sedentary behaviour. The first six (6) items collect information relating to the first domain which is Activity at work, three (3) collect information on travel to and from places, 6 collect information from the third domain which is recreational activities, and one (1) item collects information on sedentary behaviours. A literature search revealed that several studies assessed the concurrent validity of the newly translated GPAQ by correlating it with either the original English version or other PA questionnaires such as IPAQ [22–30].

GPAQ score expressed as MET-min per week: MET level x minutes of activity x events per week. To categorise the calculated MET minutes based on high, moderate, and low levels of PA, we can compare them against the WHO recommendations:

High Level: Achieving at least 3,000 MET minutes per week through any combination of moderate- and vigorous-intensity activities. **Moderate Level**: Meeting the recommendation of at least 600 MET-minutes per week through a combination of moderate- and vigorous-intensity activities. **Low Level**: Failing to meet the recommendation of at least 600 MET minutes per week.

Procedure for data collection

Ethical approval was obtained from the Ethical Committee of the Faculty of Health Sciences and Technology, Nnamdi Azikiwe University, Nnewi Campus before the commencement of the study (**FHST/REC/023/305**). The guidelines/procedure for translation, cross-cultural adaptation, and validation of the GPAQ questionnaire was based on the recommendations of Beaton et al [35]. This was categorized into 3 phases. Stage 1 involved the forward and backward translations of the English version of the GPAQ to the Igbo language. Stage 2 involved the adaptation of the GPAQ to Igbo culture and environment, while Stage 3 involved psychometric testing of the GPAQ-I. The purpose and procedure of the study were explained to the subjects who met the inclusion criteria, they were made to understand that their participation in the study was voluntary and that they were free to withdraw from the study at any moment. The informed consent of the subjects was obtained before administering the questionnaires.

Phases of adaptation

Phase 1: translation process

This initial phase involved translating the original English version of the GPAQ into the Igbo language (GPAQ-I). Two bilingual translators, fluent in Igbo as their first language, led this process. The first translator, without a medical background, approached the task unaware of its purpose. The second translator, a proficient Igbo-speaking Physiotherapist, contributed expertise. This phase resulted in the generation of two distinct Igbo versions of the GPAQ (T1 and T2). Following translation, the two versions (T1 and T2) underwent a review and discussion by the translators. This collaborative effort yielded a harmonized version (T-12) that consolidated any variations. The synthesized version (T-12) was independently translated back into English by two bilingual translators. One of these translators, unacquainted with prior translation processes, pinpointed any inconsistencies within the synthesized version. These translations were referred to as BT1 and BT2.

Phase 2: adaptation process

An expert panel, consisting of three academic Physiotherapists proficient in both English and Igbo, along with the Igbo language translators and the researcher who served as moderator, assessed the translations (T1, T2, T-12, BT1, and BT2). This committee, well-versed in health measurement scales and questionnaires and familiar with both languages and cultures ensured successful adaptation. The pre-final Igbo Version of the GPAQ was administered to 30 adults aged 18 and above. These participants were engaged in cognitive debriefing interviews, which provided insights into any unclear or confusing sentences within the pre-final GPAQ-I. The outcomes of this step were reviewed by the expert committee which led to necessary refinements and the finalization of the GPAQ-I version (Appendix A).

Phase 3: comparison phase

The adapted Igbo Version GPAQ-I, and the Original English Version of the GPAQ, were administered back to back to 155 older adults in Nnewi, Anambra state, Nigeria, aged 18 years and above. The sequence of administering the two questionnaires was randomized. Respondents were instructed to choose either I or E which was initially blinded. Those who selected "I" responded to the

GPAQ-I first, while those choosing "E" responded to the original English Version initially.

Analysis of data

Data were analyzed using the Statistical Package for Social Sciences (SPSS) version 23. Descriptive statistics of frequency count, percentage, mean, and standard deviation (SD) were used to summarize participants' sociodemographic data. Mann-Whitney U was used to test for the significant difference in the participants' scores on the GPAQ-I and the GPAQ. The Spearman rank order correlation coefficient was used to estimate the level of correlation between participants' scores on the GPAQ-I and each of their scores on the GPAQ-E. The alpha level was set at 0.05.

Results

Findings from Phases 1 and 2: Translation and Cross-cultural Adaptation Process of the Global Physical Activity Questionnaire (GPAQ) into Igbo

The original version of the GPAQ was translated into two different Igbo versions of GPAQ (T1 and T2) (Appendix A1). The two forward translations (T1 and T2) were reviewed and discussed and a synthesis (T-12) was produced (Appendix A2). The consensus version (T-12) was translated back to English Language (BT1 and BT2) (Appendix A3). The translation process was largely straightforward, retaining all items from the original with slight modifications with Igbo culture conceptually equivalent terms (Appendix B). Applicable examples were added to the questions where it was necessary. At the expert panel, the suffix "kari" was added to "eme" and "ewe" to emphasize the time usually spent doing activities. This was employed in all the questions where "in a typical week" was used. A comparison of the T12 translation with backward translations (BT1 and BT2) aimed to assess its correlation with the original GPAQ English version. To resolve discrepancies "na agafeghi oke" was replaced with "nọ oke". "iji ukwu aga" was replaced with "I nae ji ukwu aga". In item 16, "reclining" was replaced with "ịtụsa ahụ".

Thirty adults (14 males, 16 females) aged between 18 years and above participated in the pretesting and cognitive debriefing interview of this study. The participants were all employed, and 25 had at least secondary education. All the participants indicated clarity of language and ease of understanding of all the items during the cognitive debriefing interview. The participants also agreed that the terms used were the most suitable and Igbo-friendly description for it. At the second expert panel meeting, the consensus was that participants' responses at the pre-test justified the terms adapted. The expert panel made no other adjustment.

Findings from Phase 3: Comparison of the Igbo and English versions of the Global Physical Activity Questionnaire (GPAQ)

Socio-demographic distribution of the participants

A total of 155 adults participated in this present study. The average age of the participants was 48.32±19.79 years with the majority (63.9%) being female. The majority of the participants were traders (65.9%), and Senior Secondary Certificate Examination holders (61.9%) (Table 1).

Physical Activity level obtained from the original version of GPAQ, and GPAQ-I

The mean and standard deviation values of PA scores for participants were measured using the Igbo and English versions of the GPAQ. The mean scores obtained were similar and are categorized into work, transport, recreational, vigorous, moderate, and walking physical activities. The participants were found to have a mild-moderate PA level. (Table 2). The majority of the

Table 1 Distribution of participants' socio-demographics

Variable	Class	Frequency	Percentage (%)	Mean ± SD
Gender	Male	56	36.1	-
	Female	99	63.9	-
Occupation	Student	23	14.8	-
	Trader	102	65,9	-
	Teacher	11	7.1	-
	Worker	19	12.3	-
Education attainment	FLSC	30	19.4	-
	SSCE	96	61.9	-
	BSc	29	18.7	-
Age	-	-	-	48.32 ± 19.79

KEY

FLSC = First School Leaving Certificate

SSCE: Senior Secondary Certificate Examination

BSc = Bachelor's degree

Table 2 Mean Physical Activity values of the participants on the IPAQ-SF-I, and the English and Igbo versions of the GPAQ

Scores	Mean (Met/min)	Standard deviation
Igbo version of GPAQ		
Work physical activity	1322.68	2146.95
Transport Physical activity	563.41	592.66
Recreational Physical activity	939.56	2246.53
Total physical activity	2825.65	3841.28
English version of GPAQ		
Work physical activity	1322.68	2146.95
Transport Physical activity	563.41	592.66
Recreational Physical activity	939.56	2246.53
Total physical activity	2825.65	3841.28
IPAQ-SF-I		
Vigorous physical activity	576.15	1537.47
Moderate Physical Activity	746.53	1442.11
Walking Physical activity	422.55	444.49
Total physical activity	1745.24	2362.48

participants (51.37%) had moderate level of PA while 28.08% and 20.55% had high and low levels respectively. The female participants were observed to have higher scores across the three levels of PA than the male participants (Fig. 1).

Assessment of the agreement and differences in the scores on the English and Igbo Versions of the GPAQ

The results of the Mann-Whitney U test assessing differences in scores between the English and Igbo versions of the GPAQ. The mean ranks for both versions are identical across all items (U=12012.50), including work PA, transport PA, recreational PA, and total PA. The agreement coefficients (rho) for GPAQ-I, assessed item by item, domain by domain, and total mean scores correlated with GPAQ, were excellent. Using the Spearman rank order, this strong positive correlation demonstrates equivalence between the Igbo and English versions of the GPAQ. A pictorial representation of the correlation between the domains of these instruments is provided through scatter plots (Fig. 2).

Discussion

The present study aimed to cross-culturally adapt the GPAQ among adults in Nnewi, Anambra state Nigeria. The modified tool is designed to measure PA levels and sedentariness. The translation into Igbo, a widely spoken Nigerian language, enhances the instrument's effectiveness among Igbo-speaking individuals, promoting broader accessibility. The research followed the cross-cultural adaptation guidelines established by Beaton et al., [35] ensuring accuracy and precision in the adaptation process.

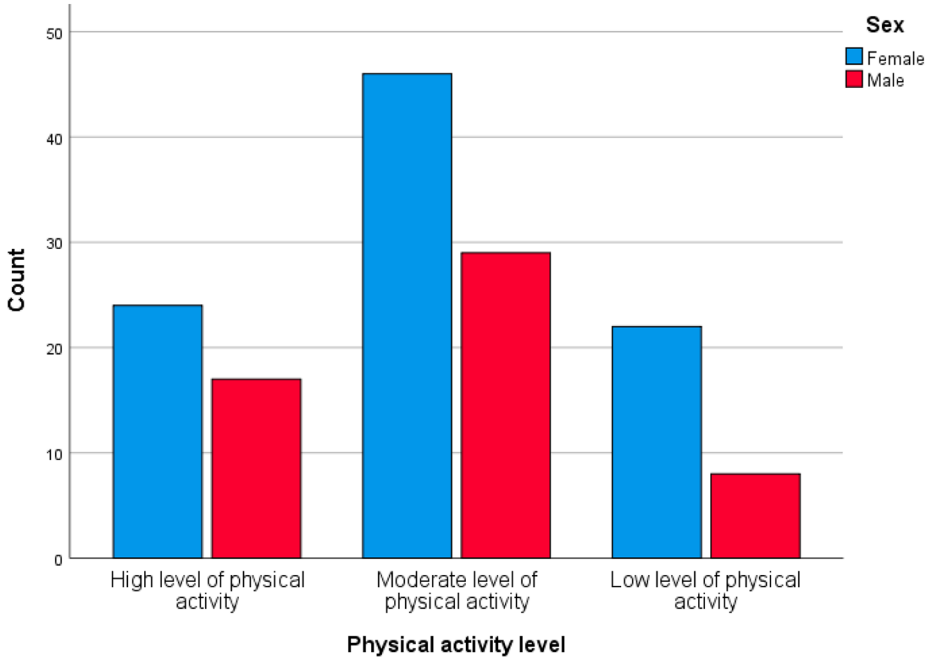

Fig. 1 Physical activity levels of the participants: The female participants reported a higher level across the three levels of physical activity than the male participants

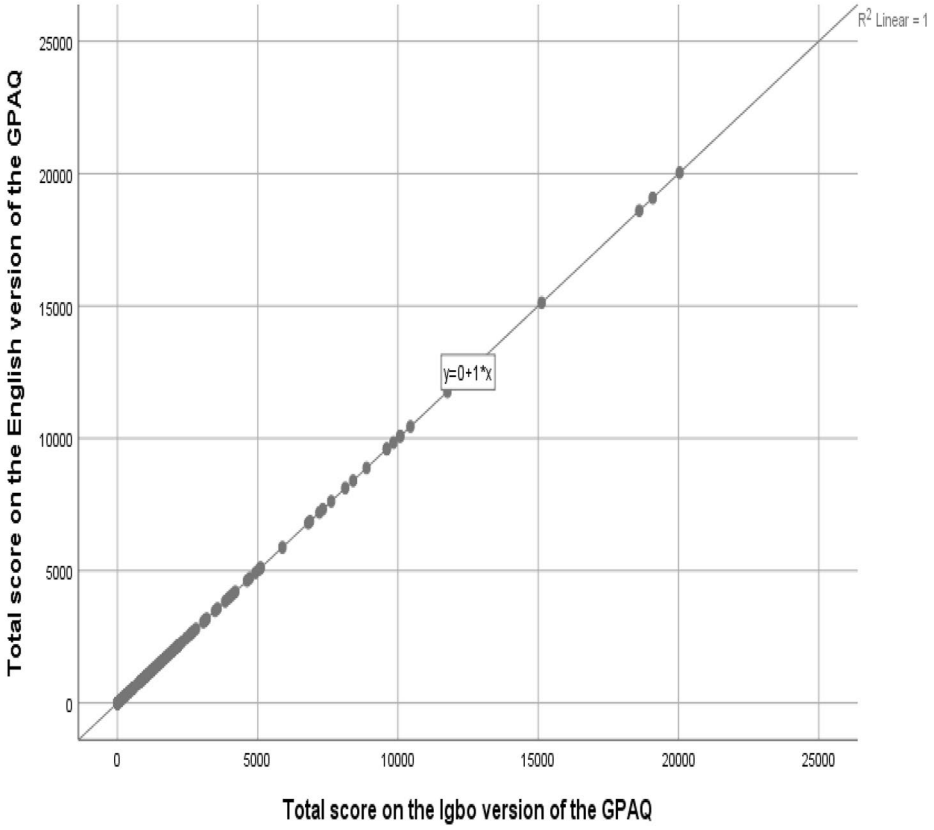

Fig. 2 Scatter Plot showing the relationship between the participants' scores in Igbo and the English versions of the GPAQ

Over the years and across various study settings, the GPAQ has consistently demonstrated its validity and reliability in measuring PA levels [22–30]. While some studies have reported mild to moderate validity, others have shown a higher level of validity in their assessments of PA. These varying outcomes may be influenced by factors such as study populations, cultural contexts, and the specific characteristics of the studied population. Despite the range in reported validity, the overall trend suggests that GPAQ remains a valuable and dependable tool for assessing PA across diverse research settings.

The translation process of the original English version of the GPAQ into the GPAQ-I encountered no difficulties, according to the researchers. The expert panel, comprising five individuals (experts in methodology, and physiotherapists), carefully assessed all GPAQ items and unanimously affirmed their relevance for measuring PA levels. Although all items were retained, the panel made certain modifications to ensure semantic, experiential, conceptual, and contextual equivalence in terms of language, instructions, examples, and options. Specifically, adjustments were made to words and phrases in the instructions, examples, and items to accurately convey meaning and understanding, aligning them with Igbo culture and environmental considerations. the suffix "kari" was added to "eme" and "ewe" to emphasize the time usually spent doing activities. This was employed in all the questions where "in a typical week" was used. A comparison of the T12 translation with backward translations (BT1 and BT2) aimed to assess its correlation with the original GPAQ English version. To resolve discrepancies "na agafeghi oke" was replaced with "nọ oke". "iji ukwu aga" was replaced with "I nae ji ukwu aga". In item 16, "reclining" was replaced with "ịtụsa ahụ".

Following Beaton et al's recommendation for cultural adaptation of pen and paper instruments, ensuring and maintaining equivalence of the old instrument in the new culture is crucial. In the case of the Igbo version and the English version of the GPAQ, no significant difference was observed in the sum of scores [35]. This suggests that both versions are equivalent, and administering either version independently is likely to yield the same results. Consequently, the GPAQ-I may effectively substitute for the GPAQ when working with individuals of Igbo language and culture, producing comparable or identical outcomes. Moreover, the GPAQ-I may be confidently administered to individuals of Igbo cultural origin and language, regardless of their location, as they would be able to interpret the context and apply it to their current environment during administration. However,

psychometric tests of this instrument are required to ascertain its use. The findings align with previous research findings where similar to the current investigation, no significant difference was observed between the culturally adapted GPAQ and other PA questionnaires [22–30]. This consistency in findings across various studies further supports the conclusion of equivalence of the adapted instruments across different cultural contexts.

According to the participants' PA distribution obtained, most of them (51.37%) participate in moderate PA. The majority of adult PA is likely low-to-moderate, according as opined in similar other studies, [10, 36, 37] but the existence of both high and low activity levels shows the variety of PA behaviors, which can be impacted by factors like environmental circumstances, health state, and personal preferences [38]. Although it was outside the scope of our study, further study is required to investigate the particular factors associated with this demographic and devise ways to address them, thereby fostering optimal PA for all populations.

Furthermore, a similar pattern was observed in the correlation coefficient between the sum scores of GPAQ and GPAQ-I. A significant relationship (rho = 1.0) across all items of the two instruments indicates excellent concurrent validity. This finding shows that the Igbo version (GPAQ-I) measures PA levels in a manner comparable to the original English version (GPAQ). Individuals completing both versions are likely to produce highly similar scores, affirming the reliability and validity of GPAQ-I. It reinforces the idea that the adapted instrument, GPAQ-I may be a reliable tool for assessing PA among individuals within the Igbo-speaking population. To support its utility in research and clinical settings within the Igbo cultural context, psychometric tests such as internal consistency, convergent validity, etc. are needed to establish its reliability.

One of the notable strengths of this study is the successful adaptation of the GPAQ into the Igbo language which holds significant importance as to the best of the researcher, it marks the first instance of such adaptation in an African language. By doing so, the study has contributed to enhancing accessibility and inclusivity in research efforts focused on PA assessment, particularly within Igbo communities. The availability of this GPQ-I will ensure the accuracy of information obtained from the patients and reduce bias, as clinicians will no longer need to interpret the original English version to Igbo since a standard translated and culturally- adapted instrument is now available and accessible. It is hoped that this culturally equivalent outcome measure will allow researchers to perform the PA level studies reliably among the Igbo Igbo-speaking population.

However, a limitation of this study is its inability to assess the validity of the instrument. To ensure the quality of the newly adapted questionnaire, conducting comprehensive psychometric tests, including criterion validity against objective measures such as accelerometer or self-report measures such as log books, is recommended. While the participants balloted on which questionnaire to respond to first, reliance on their self-reported PA levels introduces the possibility of response biases. Individuals may inaccurately recall or misrepresent their activity levels due to various factors such as social desirability bias or memory limitations, and therefore, may not fully reflect the true extent of within the Igbo-speaking population. Additionally, administering the questionnaires in immediate back-to-back sessions to the participants could have introduced a recall bias, which may have influenced the lack of differences found across the scores of the English and Igbo versions of the questionnaire. Future studies should consider allowing more time between questionnaire administrations to minimize the potential impact of recall bias and provide a more accurate assessment of differences between the versions.

Conclusion

In conclusion, the Igbo version of the GPAQ has been successfully adapted and demonstrates strong agreement with the original English version. While this adaptation suggests that GPAQ-I can be effectively utilized as an outcome measure for Igbo-speaking individuals to assess PA levels, further psychometric testing is required to fully establish its internal consistency, reliability, and validity.

Recommendation

Based on the findings of this study, it is recommended that the GPAQ-I should be tested psychometrically before being used as an outcome measure specifically tailored for Igbo monolingual individuals. Also, it should be utilized in research and clinical studies to accurately assess PA levels among the Igbo population. Regular validation studies can assess its reliability and validity in various contexts and populations within Igbo-speaking communities. Lastly, researchers should translate, and validate the GPAQ in other major languages in Africa and Nigeria such as Hausa, Yoruba etc. to broaden its clinical assessment and evaluation capabilities.

Supplementary Information

The online version contains supplementary material available at https://doi.org/10.1186/s44167-024-00061-9.

Supplementary Material 1

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Author contributions
IO and SO conceptualized the study, SO, IA, and IO oversaw the methodology . SO oversaw the data collection, EO analyzed data and prepared the tables, SO wrote the initial draft of the paper, and prepared the manuscript. CK prepared the second draft of the manuscript, CA and IO supervised the work. All authors read, revised and approved the final version of the manuscript.

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Data availability
The datasets used and analyzed during the current study are available from the corresponding author upon reasonable request.

Declarations

Ethics approval and consent to participate
The study was conducted following the Declaration of Helsinki, and was approved by the Ethics Committee of the Faculty of Health Sciences and Technology, Nnamdi Azikiwe University, Awka (FHST/REC/023/305). Informed consent was obtained from all the participants before the commencement of the study.

Consent for publication
Not applicable.

Competing interests
The authors declare no competing interests.

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References

1. Olawuyi T, Adeoye A. The prevalence and associated factors of non-communicable disease risk factors among civil servants in Ibadan, Nigeria. PLoS One. 2018;13(9). https://doi.org/10.1371/journal.pone.0203587
2. Islam SM, Purnat TD, Phuong NT, Mwingira U, Schacht K, Fröschl G. Non-communicable diseases (NCDs) in developing countries: a symposium report. Globalization Health. 2014;10:1–8.
3. Olukoya O. The war against non-communicable disease: how ready is Nigeria? Ann Ibadan Postgrad Med. 2017;15(1). https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5598443/
4. Caspersen J, Powell E, Christenson M. Physical activity, exercise, and physical fitness: definitions and distinctions for health-related research. Public Health Rep. 1985;100(2):126 – 31. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC1424733/
5. Pinckard K, Baskin KK, Stanford KI. Effects of Exercise to Improve Cardiovascular Health. Front Cardiovasc Med. 2019;6. https://doi.org/10.3389/fcvm.2019.00069.
6. Sgrò P, Sansone M, Sansone A, Sabatini S, Borrione P, Romanelli F, Di Luigi L. Physical exercise, nutrition and hormones: three pillars to fight Sarcopenia. Ageing Male. 2019;22(2):75–88.
7. Siegmund A, Distelhorst S, Bena F, Morrison L. Relationships between physical activity, social isolation, and depression among older adults during COVID-19: A path analysis. Geriatr Nurs. 2021;42(5). https://doi.org/10.1016/j.gerinurse.2021.08.012
8. Ng P, Koh E, Tan C. Physical activity and sedentary behaviour of ambulatory older adults in a developed Asian community: A cross-sectional study. Singapore Med J. 2020;61(5). https://doi.org/10.11622/smedj.2020022
9. Okoye C, Onwuakagba U, Akile C, Okonkwo P, Akosile O, Mgbeojedo G, Oyewumi J, Kubeyinje OS. Social Support, General Self-Efficacy, Fear of Falling, and Physical Activity Among Older Adults in a Middle-Income Country. Gerontol Geriatr Med. 2022;8(1). https://doi.org/10.1177/23337214221097750
10. Akosile O, Igwemmadu K, Okoye C, Odole C, Mgbeojedo G, Fabunmi A, Onwuakagba U. Physical activity level, fear of falling and quality of life: a comparison between community-dwelling and assisted-living older adults. BMC Geriatr. 2021;21(1):12–18. https://doi.org/10.1186/s12877-020-01982-1
11. Benavent-Caballer V, Rosado-Calatayud P, Segura-Ortí E, Amer-Cuenca J, Lisón J. Effects of three different low-intensity exercise interventions on physical performance, muscle CSA and activities of daily living: a randomised controlled trial. Exp Gerontol. 2014;58:159–65. https://doi.org/10.1016/j.exger.2014.08.004.
12. Shabu A, Saka H, Al-Banna A, Zaki M, Ahmed M, Shabila P. A cross-sectional study on the perceived barriers to physical exercise among women in the Iraqi Kurdistan Region. BMC Womens Health. 2023;23(1):543. https://doi.org/10.1186/s12905-023-02696-3
13. Pelletier CA, White N, Duchesne A, Sluggett L. Barriers to physical activity for adults in rural and urban Canada: A cross-sectional comparison. SSM Popul Health. 2021;16(1). https://doi.org/10.1016/j.ssmph.2021.100964
14. Koh S, Asharani V, Devi F, Roystonn K, Wang P, Vaingankar A, Abdin E, Sum F, Lee S, Müller-Riemenschneider F, Chong A. A cross-sectional study on the perceived barriers to physical activity and their associations with domain-specific physical activity and sedentary behaviour. BMC Public Health. 2022;22(1):1–11.
15. Taylor-Piliae RE, Norton LC, Haskell WL, Mahbouda MH, Fair JM, Iribarren C, Hlatky MA, Go AS, Fortmann SP. Validation of a new brief physical activity survey among men and women aged 60–69 years. Am J Epidemiol. 2006;164(6):598–606. https://doi.org/10.1093/aje/kwj248.
16. Washburn RA, Smith KW, Jette AM, Janney CA. The physical activity scale for the Elderly (PASE): development and evaluation. J Clin Epidemiol. 1993;46(2):153–62.
17. Godin G, Shephard RJ. Leisure Time Exercise Questionnaire. Can J Appl Sport Sci. 1997;6(2):12–24.
18. Mathews E, Salvo D, Sarma PS, Thankappan KR, Pratt M. Adapting and validating the global physical activity questionnaire (GPAQ) for Trivandrum, India, 2013. Prev Chronic Dis. 2016;13:E53. https://doi.org/10.5888/pcd13.150528.
19. World Health Organization. Global physical activity questionnaire (GPAQ). 2023. https://www.who.int/publications/m/item/global-physical-activity-questionnaire
20. Mathews E, Salvo D, Sarma S, Thankappan R, Pratt M. Adapting and Validating the Global Physical Activity Questionnaire (GPAQ) for Trivandrum, India, 2013. Prev Chronic Dis. 2016;13(1). https://doi.org/10.5888/pcd13.150528
21. Narin S, Unver B, Bakirhan S, Bozan O, Karatosun V. Cross-cultural adaptation, reliability and validity of the Turkish version of the hospital for special surgery (HSS) knee score. Acta Orthop Traumatol Turc. 2014;48(3):241–8.
22. Siettou K, Fotos V, Brokalaki H, Giannakopoulou M. Cultural adaptation and reliability of the 'Global physical activity questionnaire' in patients with heart failure in Greece. Br J Card Nurs. 2020;15(1):1–11.
23. Singh H, Singh S, Singh A. Punjabi Adaptation of WHO's Global Physical Activity Questionnaire (GPAQ) in Gurumukhi Script: A Validity and Reliability Study. Med Leg Update. 2020;20(3).
24. Rivière F, Widad FZ, Speyer E, Erpelding M, Escalon H, Vuillemin A. Reliability and validity of the French version of the global physical activity questionnaire. J Sport Health Sci. 2018;7(3). https://doi.org/10.1016/j.jshs.2016.08.004
25. Mumu J, Ali L, Barnett A, Merom D. Validity of the global physical activity questionnaire (GPAQ) in Bangladesh. BMC Public Health. 2017;17:650. https://doi.org/10.1186/s12889-017-4666-0
26. Soo L, Wan Abdul Manan M, Wan Suriati N. The Bahasa Melayu version of the global physical activity questionnaire: reliability and validity study in Malaysia. Asia Pac J Public Health. 2015;27(2):NP184–93.
27. Bergier J, Wasilewska M, Szepeluk A. Global Physical Activity Questionnaire (GPAQ)–the Polish version. Health Probl Civiliz. 2019;13(1):1–8. https://doi.org/10.5114/hpc.2018.80229
28. Ács P, Bethlehem J, Oláh A, Berger B, Morvay-Say K, Makai A, Prémusz V. Cross-cultural adaptation and validation of the Global Physical Activity Questionnaire among healthy Hungarian adults. BMC Public Health. 2020;20(Suppl 1):20(1). https://doi.org/10.1186/s12889-020-08477-z
29. Adıgüzel İ, Durusoy Onmuş İR, Mandıracıoğlu A, Öcek ZA. Adaptation of the Global Physical Activity Questionnaire (GPAQ) into Turkish: A validation and reliability study. Turk J Phys Med Rehabil. 2021;67(2):175–186. https://doi.org/10.5606/tftrd.2021.1675
30. Chukwuma O, Agbim W. An Evaluation of the Use of Igbo Language for Communication Among Residents of South-East Nigeria. Eur Sci J. 2020;16(23):172–184. https://doi.org/10.19044/esj.2020.v16n23p172
31. Ezeani I, Rayson P, Onyenwe I, Uchechukwu C, Hepple M. Igbo-English machine translation: An evaluation benchmark. arXiv preprint arXiv:2004.00648. 2020.
32. Maikanti S, Chukwu A, Odibah MG, Ogu MV. Globalization as a factor for Language Endangerment: Nigerian indigenous languages in Focus. Malays J Soc Sci Humanit (MJSSH). 2021;6(9):521–7.

33. Balogun OG, Entrepreneurship Education. A Study of Culture, Mindsets and Teaching Practices in Nigeria (Doctoral dissertation, University of Pennsylvania). 2020.
34. Faul F, Erdfelder E, Buchner A, Lang AG. Statistical power analyses using G* power 3.1: tests for correlation and regression analyses. Behav Res Methods. 2009;41(4):1149–60.
35. Beaton E, Bombardier C, Guillemin F, Ferraz B. Guidelines for the process of cross-cultural adaptation of self-report measures. Spine. 2000;25(24):3186–3191. https://doi.org/10.1097/00007632-200012150-00014
36. Ugwueze FC, Agbaje OS, Umoke PC, Ozoemena EL. Relationship between physical activity levels and psychological well-being among male university students in South East, Nigeria: a cross-sectional study. Am J Men's Health. 2021;15(2):15579883211008337.
37. Ikechukwu EC, Gloria MU, Ikenna UC, Chinonso UV, Ekezie U, Nkechi C. Physical activity level and factors affecting exercise participation among Nigerian adults with and without diabetes. World Health. 2021;60:85.
38. Charles OO, Chinaza NK. Barriers and facilitators of physical activity participation among Youth with Visual and hearing impairments in Nigeria: a qualitative study. Palaestra. 2018;32(3).

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