

Original Research Article

Marathi version of Global Physical Activity Questionnaire: translation, reliability and validation in individuals with metabolic syndrome

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ABSTRACT

Background: Regionally translated version of Global Physical Activity Questionnaire (GPAQ) will help ensure comprehension; cultural relevance. MS is a cluster of conditions that contributes towards cardiovascular diseases. Physical inactivity is one factor that has impact on all of the associated co morbidities. Evaluation of physical activity (PA) will help to implement strategies to overcome burden of physical inactivity and sedentary behavior.

Methods: Phase was translation in Marathi was done via forward -backward translation, expert panel discussions and cognitive debriefing interviews. Utmost attention was paid to retain original concept of questionnaire. Phase 2 was psychometric testing and validation in individuals with MS; Purposive sampling. Sample size -50 using: $n = Z^2 \cdot k \cdot (1-p)/E^2$; $z = 1.96$, $k = 1$, keeping margin of error as 0.1, ICC of 0.87. Sequence of administration of versions was selected randomly by participants and were administered with gap of 7 days. Participants were instructed to follow same activity pattern they usually practice.

Results: Phase I following a through item- by- item review, panel reported good agreement between two versions of GPAQ in terms of semantic, conceptual and cultural equivalence. Phase II ICC of 0.998 (95% CI: 0.997-0.999, $p < 0.001$), indicates a very high degree of consistency between repeated administrations. Wilcoxon signed rank test suggested no significant difference in ratings between both versions of GPAQ.

Conclusions: Marathi version of GPAQ demonstrated high level of agreement, linguistic equivalence. Translated Marathi version demonstrated acceptable concurrent validity and reliability in individuals with metabolic syndrome. Findings support its use as subjective tool for assessment and surveillance of physical activity and sedentary behavior among Marathi-speaking populations.

Keywords: Assessment of physical activity, GPAQ, Marathi version, Metabolic syndrome, Reliability, Validity

INTRODUCTION

Non communicable diseases (NCDs) are chronic diseases that are long lasting and are caused by combination of genetic, physiological, environmental and behavioral factors and are collectively responsible for 74% of all the deaths worldwide. It is reported that approximately 17 million people die because of NCD before the age of 70

and 86% of these premature deaths occur in low- and middle-income countries.¹ Modifiable factors like tobacco use, physical inactivity, unhealthy dietary habits and harmful use of alcohol increases the risk of developing NCDs. Metabolic risk factors that can contribute towards the risk of developing NCDs are overweight/obesity, raised blood pressure, hyperglycemia and hyperlipidemia.²

Physical inactivity has been established to be a major contributor towards the development of NCDs. Physical inactivity also increases the risk of developing cardiovascular diseases, hypertension, type 2 diabetes mellitus, anxiety and depression along with other mental health issues and also some type of cancers.³ Thus it is essential to reduce physical inactivity and shift towards being more physically active to have a positive effect on various aspects of health. WHO has defined physical activity as “any bodily movement produced by skeletal muscles that requires energy expenditure.” It encompasses various movements or activities performed at a person’s workplace, household chores, travel to and from places or as a part of recreational or leisure activities.⁴ ACSM has defined physical activity as “any bodily movement produced by the contraction of skeletal muscles that result in a substantial increase over resting energy expenditure.”⁵ It has been well established that regular physical activity provides significant physical and mental health benefits. It has also been proved that regular physical activity can contribute towards the prevention as well as management of non-communicable diseases. It also helped to manage various symptoms related to lifestyle related disorders. Along with this regular physical activity also helps to improve overall well-being and quality of life.⁴

In order to measure the level of physical activity, it is essential to understand the domains or different aspects of physical activity. It can be classified as structured or incidental. Incidental physical activity is not planned and is usually a part of daily activities at work or at home or travel whereas structured physical activity is exercise which is planned, purposeful activity undertaken to promote health and fitness benefits.⁵ There are 4 dimensions to physical activity viz, frequency, intensity, time and mode, which need to be considered while evaluating physical activity. Along with these dimensions; 4 domains of physical activity that need to be considered while evaluating level of physical activity are: occupational, leisure time, domestic and transportation.⁶ All these aspects need to be evaluated in order to have a comprehensive evaluation of physical activity in an individual. There are 2 broad categories of methods available to evaluate physical activity level; subjective and objective. Subjective methods rely on the individual either to record activity as it occurs or by recalling previous activities. Objective methods include equipment to directly measure the physical activity performed like accelerometers, wearable monitors etc. Physical activity can be assessed subjectively via either questionnaires or recall logs or diaries. Metabolic Equivalent (METs) is usually used for denoting the intensity or calculation of physical activity via these questionnaires. “Compendium of Physical Activity” gives detailed list of activities with their metabolic equivalent value which would provide a better understanding of different intensity of activities.⁶⁻⁷

Diaries/logs are used in order to obtain detailed hour by hour or detailed activity record of one’s activity level or

sedentary behaviour. Many a times these activity logs are used as an adjunct to objective monitoring or to evaluate psychometric properties of physical activity questionnaires. The Bouchard Physical Activity Record and the Log developed by Ainsworth and colleagues are some of the examples of activity logs. Objective methods used to measure physical activity can be classified into 4 main categories: measures of energy expenditure, physiological measures, motion sensors and assessment methods that combine more than one type of sensor. Indirect calorimetry, direct observation and doubly labelled water method are examples of measures of energy expenditure. Physiological measures include heart rate monitoring; some of the most commonly used motion sensors are accelerometers and pedometers.⁶ Each of these methods come with its own set of advantages and disadvantages.

Global physical activity questionnaire, international physical activity questionnaire, physical activity scale for the elderly, physical activity questionnaire for older children, general practice physical activity questionnaire, Kaiser physical activity survey, physical activity questionnaire, Yale physical activity survey are some of the questionnaires commonly used for estimating the level of physical activity. The Global Physical Activity Questionnaire was developed by World Health Organization (WHO) for surveillance of physical activity in various countries. This questionnaire was developed to reduce inter-country as well as within country variations in the evaluation of physical activity. This questionnaire has been developed to be administered via face-to-face interview which needs to be conducted by trained interviewers. It has been widely tested in large scale, general adult population-based surveys.⁸ Use of such validated and widely accepted questionnaires will help to maintain standardization of data globally. GPAQ gives information on physical activity based on three settings viz: Activity at work, travel to and from places and recreational activities. Activities are categorized under vigorous and moderate intensity activities. In addition to the level of Physical activity, it also helps grade sedentary behavior. It comprises of 16 questions analyzing the above-mentioned domains. It also gives detailed guidelines for the analysis, making it user friendly. Analysis of data using GPAQ is done via Metabolic equivalents (METs).⁸ This can be then converted to MET-minutes, which further helps to assign the individual in different grades of being physically active. It has been established to be a suitable and acceptable instrument to measure physical activity. Reliability coefficients (Kappa 0.67 to 0.73; Spearman’s rho 0.67 to 0.81) were of moderate to substantial strength while results on concurrent validity between GPAQ and IPAQ demonstrated a moderate to strong positive relationship (range 0.45 to 0.65).⁹ Validity has also been shown to be moderate for moderate- vigorous intensity physical activities while poor for sedentary behavior.¹⁰

Metabolic syndrome is a cluster of conditions that occur together increasing risk of heart diseases, stroke and type 2 diabetes. It is largely contributing to the global cardiovascular crisis. Metabolic syndrome was diagnosed according to the harmonized criteria proposed in the joint interim statement of the International Diabetes Federation (IDF), National Heart, Lung, and Blood Institute (NHLBI), and American Heart Association (AHA), along with other participating organizations. It is characterized by presence of 3 or more of the following factors: elevated waist circumference, triglycerides ≥ 150 mg/dL or drug treatment for elevated triglycerides, HDL ≤ 40 mg/dL for males and ≤ 50 mg/dL in females or drug treatment for low HDL, BP $>130/85$ mm Hg or on antihypertensive and Fasting glucose ≥ 100 mg/dL or on medical treatment for elevated glucose.¹¹

Individuals with metabolic syndrome (MS) were selected as the primary population for validation of the Global Physical Activity Questionnaire (GPAQ) due to the central role of physical inactivity in the development and progression of the syndrome. Physical inactivity is recognized as a major modifiable risk factor contributing to obesity, insulin resistance, dyslipidemia, hypertension, and cardiovascular disease, all of which are key components of MS. Regular monitoring of physical activity is therefore essential for both disease management and evaluation of lifestyle-based interventions in this population. Despite the widespread use of the GPAQ across diverse populations, relatively few validation studies have specifically focused on individuals with metabolic syndrome, particularly in low- and middle-income countries. Given that individuals with MS often exhibit distinct patterns of physical activity and sedentary behaviour compared with the general population, establishing the validity and reliability of the GPAQ in this group is important to ensure accurate assessment and monitoring of physical activity. Therefore, validating the GPAQ among individuals with metabolic syndrome addresses an important gap in the literature and supports its use in both clinical practice and research involving this high-risk population.

Standard English version of such questionnaires limits its applicability among populations with limited English proficiency. Marathi is official language of Maharashtra and is spoken by over 83 million, making it the third most spoken language in India.¹² Many individuals, particularly in rural and semi-urban regions may not fully comprehend English-based questionnaires. Hence need was felt for translation in regional Marathi language. Regionally translated version of GPAQ will help ensure better comprehension and cultural relevance. It will help our population to understand the different domains of physical activity in better way. This in turn will also help to implement specific strategies to overcome the burden of physical inactivity and sedentary behavior.

Primary objective of this study was to translate GPAQ in Marathi language via forward and backward translation

method and then test the validity and reliability of the translated Marathi version of questionnaire in individuals with metabolic syndrome.

METHODS

This study had been planned in 2 major steps; Step 1- Translation of the original GPAQ into Marathi version and Step 2-Psychometric testing and validation of the Marathi Translated version of GPAQ in individuals with metabolic syndrome. Institutional Ethics Committee clearance was sought before conducting the study. The duration of the entire study extended from February 2024 to June 2025.

Phase 1: Translation process (forward and backward translation) of the English version of GPAQ into Marathi

Forward translation: Two translators with expertise in Marathi language, with no medical background, were approached separately for translation of the questionnaire in Marathi. The 2 versions generated were discussed and merged into one final draft-synthesis. This draft then underwent review with an expert panel of 3 physiotherapists who have expertise and have used GPAQ extensively for their research purposes. Suggestions from them were incorporated through a consensus meeting with the 2 Marathi language experts and 3 physiotherapist's on the panel.

Backward translation: The translated Marathi version was then back translated into English by two translators separately, who had expertise in English language and no medical background, A consensus meeting was held between the Marathi and English translators for further refinement.

The forward and backward translators were native Marathi speakers with postgraduate qualifications in language-related disciplines and more than five years of experience in bilingual translation and cross-cultural adaptation of research instruments. Both translators demonstrated advanced proficiency in Marathi and English and had received formal training in translation methodologies. Consistent with established cross-cultural adaptation guidelines, translators without a medical background were intentionally selected to minimize professional bias and to ensure that the translated questionnaire reflected language that would be easily understood by the target population. Throughout the translation process, the translators worked closely with the research team and subject experts to resolve discrepancies, ensure conceptual equivalence, and maintain the accuracy and cultural relevance of the translated instrument.

This draft then underwent an expert panel review for validation and expert opinions were sought for the finalization of the Marathi version of the GPAQ

questionnaire. Utmost attention was paid to retain the original concept of the questions in the English version of GPAQ. Necessary refinements were done and the Marathi version of the GPAQ was finalized. Once the final version was ready, 15 adults, graduates in different fields, with no medical background and well versed with both the languages were approached for pretesting and cognitive debriefing interview. They were asked to go through both the versions of the questionnaire, item by item and opine about the clarity and ease of understanding of the translated Marathi version of the questionnaire. Marathi version of the GPAQ was then finalized.

Phase 2: Comparison/validation of the English and Marathi versions of GPAQ in individuals with metabolic syndrome.

Study design was cross-sectional study; setting being community. Purposive sampling was intentionally employed because the primary objective of the study was to evaluate the validity and reliability of the Marathi version of the GPAQ specifically among individuals diagnosed with metabolic syndrome rather than to generate population-level estimates of physical activity. Sample included individuals meeting the diagnostic criteria for metabolic syndrome. They were recruited from the community and from private clinics of physicians in Pune city.

For the purpose of linguistic validation and assessment of equivalence between the original and translated versions, participants were required to be proficient in both English and Marathi. This approach enabled direct comparison of responses across the two versions. Concurrent validity was tested against established original English GPAQ. Individuals who had undergone any recent cardiac/abdominal surgeries, individuals with major or serious metabolic or respiratory conditions were excluded from the study. Sample size was calculated using formula: $n = Z^2 k \cdot (1-p) / E^2$; assuming $z = 1.96$ (for 95% confidence), $k = 1$ (one measurement per person), keeping margin of error as 0.1 and ICC of approximately 0.87; sample size was calculated to be 50.

Subject information sheet was provided and informed consent was sought. The participants were administered Marathi and English version of GPAQ with a gap of 7 days in between. The participants were administered Marathi and English version of GPAQ; the sequence of administration of which was selected randomly by the participants. Participants were asked to select between two envelopes labeled "E" and "M". They were blinded to the versions; E for the English version and M for Marathi version. The sequence selected was followed for the administration of both the versions. All the participants were instructed to follow the same activity pattern that they usually practice. Both the versions were administered via an interview basis. The results from both the versions were then compiled and analyzed.

RESULTS

Findings from Phase 1: Translation process - forward and backward translation of the English version of GPAQ into Marathi

A consensus meeting was conducted with an expert panel comprising three senior physiotherapists with extensive experience in physical activity assessment, questionnaire administration, and the use of the Global Physical Activity Questionnaire (GPAQ), along with Marathi and English language experts experienced in translation questionnaire development and linguistic validation. The physiotherapists served as content experts to evaluate the relevance, clarity, and conceptual equivalence of the questionnaire items, while the language experts assessed semantic and linguistic equivalence between the translated Marathi version and the original English version. The panel reviewed all translated items and resolved discrepancies through consensus to ensure conceptual, semantic, and contextual equivalence of the final Marathi version. Following a thorough item-by-item review, the panel reported good agreement between the two versions of GPAQ in terms of semantic, conceptual and cultural equivalence.

No major discrepancies requiring retranslation were identified. The final reconciled version incorporated the most appropriate and contextually accurate elements.

Cognitive debriefing interview: Total 15 adults were approached for the cognitive debriefing interview of the study. They suggested that the translated Marathi version of the questionnaire had good clarity of language and also ease of understanding of all the items. These participants also agreed that the terms used in Marathi version were most appropriate to describe the domains of GPAQ. They also stressed the importance of translating the GPAQ questionnaire into a regional language to improve comprehension of its purpose and content. They noted that translating the GPAQ into the regional language significantly aids in understanding its intent and components.

Findings from Phase 2: Comparison/validation of the English and Marathi versions of GPAQ in individuals with metabolic syndrome

Total of 50 participants were included in this phase of the study. 23 (46%) were males and 27 (54%) were females. The mean age of the study participants was 49.98 ± 6.98 years. Total 35 (70%) participants had type 2 diabetes mellitus, 2 (4%) had dyslipidemia; all of the participants; 50 (100%) belonged to overweight/obese categories, 29 (58%) participants had hypertension. The mean waist circumference of these study participants was 118.55 ± 3.87 centimeters. In order to test concurrent validity against established original English GPAQ, all the participants were administered the English and Marathi version of the questionnaires (sequence randomly

allocated) with a gap of one week between the two versions. Analysis was done for work related activities (vigorous and moderate intensity), activities involved in travelling to and from places; and leisure or recreation related activities (vigorous and moderate intensity). This was analyzed using MET-Minute criteria wherein the number of days a week a specific activity is performed is multiplied by the time for which it is performed and a constant of 4- for moderate intensity activities and 8 for

vigorous intensity activities.⁸ The distribution of the same for the English and Marathi versions of the questionnaire is demonstrated in Table 1. Total level of physical activity of the participant by adding work related, travel related and leisure related activities is also calculated and demonstrated in Table 1. Sedentary behavior analyzing the amount of time spent in sitting/reclining that could be at work, during travel or leisure related was also calculated in terms of hours per day.

Table 1: Physical activity across various domains of GPAQ in accordance with the English and Marathi versions.

Variables	English version MET minutes/week	English version MET minutes/week	Marathi version MET minutes/week	Marathi version MET minutes/week
	Mean	SD	Mean	SD
Total physical activity	513.2	644.19	518.4	654.11
Vigorous work activity	0	0	0	0
Moderate work activity	14	70.01	14	70.01
Transport activity	34	108.59	34	108.59
Vigorous recreational	90.4	390.81	90.4	390.81
Moderate recreational	374.80	424.7	380.0	429.57
Sedentary	824.6 (minutes/day) (13.74 hrs /day)	87.78 (minutes/day) (1.46 hrs/day)	825.8 (minutes/day) (13.76 hrs/day)	89.23 (minutes/day) (1.48 hrs/day)

Test-retest reliability was assessed primarily using the Intraclass Correlation Coefficient (ICC) based on a two-way mixed-effects model. The questionnaire demonstrated excellent reliability, with a single-measure ICC of 0.998 (95% CI: 0.997-0.999, $p < 0.001$), indicating a very high degree of consistency between repeated administrations. Cronbach's alpha was also calculated and found to be 0.99 indicating excellent reliability and internal consistency. Scatter plot for the same is illustrated in Figure 1.

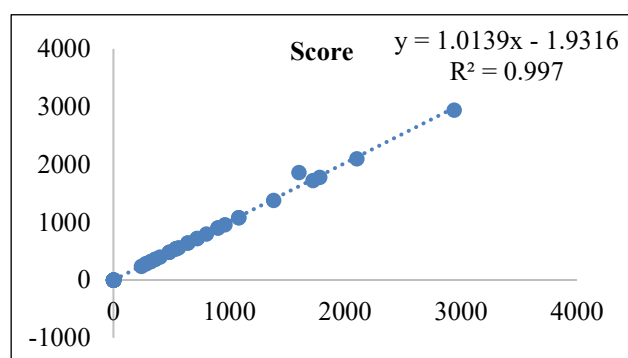


Figure 1: Relationship between the participants scores in the English and Marathi versions of GPAQ.

Table 3: Statistics from for the Wilcoxon signed ranks test for English and Marathi versions of GPAQ.

Variables	English Median (IQR)	Marathi Median (IQR)	Z value	P value
Total physical activity (MET-min/week)	340 (0-740)	340 (0-740)	-1.000	0.317
Vigorous work activity	0 (0-0)	0 (0-0)	0.000	1.000
Moderate work activity	0 (0-0)	0 (0-0)	0.000	1.000
Transport activity	0 (0-0)	0 (0-0)	0.000	1.000
Vigorous recreational activity	0 (0-0)	0 (0-0)	0.000	1.000

Continued.

Table 2: Correlation and reliability between English and translated Marathi Version of GPAQ.

		English	Marathi
English	Pearson Correlation	1	0.999**
	Sig. (2-tailed)		0.000
	N	50	50
Marathi	Pearson Correlation	0.999**	1
	Sig. (2-tailed)	0.000	
	N	50	50

**Correlation is significant at the 0.01 level (2-tailed)

Parallel forms reliability was assessed to examine if both the versions produced consistent results when administered to the same group. Cross-language equivalence was demonstrated by the strong agreement between the English and Marathi versions ($r = 0.999$), demonstrated in Table 2.

The data was also subjected to Sig (2 tailed) test and p value was calculated which is demonstrated in Table 2. It suggests strong positive correlation between the two versions and as $p < 0.001$, it suggests both the versions are very likely measuring the same construct.

Variables	English Median (IQR)	Marathi Median (IQR)	Z value	P value
Moderate recreational activity	320 (0-640)	320 (0-640)	-1.000	0.317
Sedentary behaviour (min/day)	840 (780-900)	840 (780-900)	-1.000	0.317

Wilcoxon Signed-Rank test was performed for both the English and Marathi versions. Details of the same are represented in Table 3. Corresponding Z and p values are given in Table 3. There is no significant difference in ratings between the English and Marathi versions of the GPAQ.

DISCUSSION

The Global Physical Activity Questionnaire (GPAQ) was developed by the World Health Organization (WHO) as part of its STEP wise approach to Surveillance (STEPS) to monitor physical activity patterns at the population level. Designed for use across diverse settings and cultures, GPAQ provides a standardized tool to assess physical activity in three domains: activity at work, travel to and from places, and recreational activities. It also captures sedentary behavior through a single question on sitting time.⁸ Some of the traditional tools focus solely on leisure-time physical activity; however, GPAQ offers a comprehensive picture of an individual's total physical activity by considering all major life domains. This makes it particularly valuable in low- and middle-income countries, where occupational and transport-related physical activity often form the bulk of total activity. The GPAQ has been widely adopted in epidemiological research and national health surveys due to its simplicity, cultural adaptability, and comparability across populations. Its data have been instrumental in shaping public health policies aimed at reducing physical inactivity, a major risk factor for non-communicable diseases (NCDs) such as cardiovascular disease, diabetes, and certain cancers. It has been shown to have moderate to good reliability and moderate validity.^{9,13-14}

However, its standard version is in English, which limits its applicability among populations with limited English proficiency. Marathi is the official language of Maharashtra and is spoken by over 83 million people, making it the third most spoken language in India.¹² Many individuals, particularly in rural and semi-urban regions of Maharashtra, may not fully comprehend English-based questionnaires. Using the English version in such settings may lead to misinterpretation, inaccurate responses, and poor data quality. Thus, need was felt to translate GPAQ in Marathi language in order to ensure comprehension, cultural relevance and enable its use in public health surveys, epidemiological research and also community health care camps/programs across Maharashtra and other Marathi speaking regions. It might also help to improve accuracy and reliability of self-reported or subjectively collected physical activity data. This in turn might also assist to promote inclusivity in research by allowing Marathi speaking/non-English speaking participants to provide insightful contribution.

Going forward, a validated Marathi version would support state-level surveillance of physical inactivity burden and help guide local health interventions and policies aimed at reducing the prevalence of non-communicable diseases.

Translation of GPAQ has been done in IGBO, French, Turkish and Bahasa Melayu. It has been translated or culturally adapted in these languages. All of these studies have demonstrated acceptable- good reliability and validity of the translated versions. They are used extensively for research purposes in their respective regions.¹⁵⁻¹⁸ GPAQ has also been translated in Punjabi language (Gurmukhi Script) using forward and backward translation method in order to make it more culturally suitable for administration on the Punjabi population. It was also tested for reliability and validated by administering both the versions of GPAQ among 81 study participants. The results demonstrated good reliability and validity for the Punjabi translated version of GPAQ.¹⁹ A study was conducted in Tiruvananthapuram, in order to culturally adapt and translate GPAQ. Modified version of GPAQ was designed by adding a physical activity chart specific to the locale. These local physical activities were identified through detailed in-depth interviews, group discussions, observation and using an accelerometer for validation in 47 participants. The study concluded moderate level of agreement between the two versions for assessing physical activity among women in India with the cultural adaptation being useful in other low- middle income countries where activities are of diverse intensity and nature.²⁰

In our study, ICC of 0.998 (95% CI: 0.997-0.999, $p < 0.001$), indicates a very high degree of consistency between repeated administrations. Thus, it can be used extensively for evaluation of physical activity subjectively and via self-reported method considering linguistic and cultural relevance. Our study involved the forward and backward translation process by experts in English and Marathi language. Also, panel of experts from the physiotherapy fraternity helped to find and resolve lacunae if any. The cognitive debriefing process involving adults who were well-versed in both languages but had no medical background provided valuable insights into how the translated Marathi version of the questionnaire was perceived by individuals from a non-medical background. This feedback further contributed towards enhancing the clarity and broader acceptability of the Marathi version among the general population. The participants in the cognitive debriefing process reported no discrepancies between the Marathi translated version and the original version of the questionnaire. They provided positive feedback regarding the clarity,

comprehension, and overall quality of the translation. They also emphasized the need for a regional language translation to enhance understanding of the purpose and content of the GPAQ questionnaire.

The translated Marathi version of GPAQ can have many clinical implications. Using a regionally translated version ensures that patients clearly understand the questions, especially in settings where English proficiency is low, which can lead to more accurate self-reporting of physical activity levels. Accurate assessment of physical activity might help identify sedentary individuals at risk of non-communicable diseases (NCDs) like diabetes, hypertension, and obesity; early detection can also help guide timely interventions. Reliable information on a patient's physical activity can help support more personalized lifestyle recommendations and treatment planning. It might also help in monitoring progress over time, especially in rehabilitation or chronic disease management. Regional language questionnaires ensure that non-English-speaking or low-literacy populations are not excluded from proper assessment and also promotes equity in healthcare delivery, especially in rural or underserved areas. There is also a high possibility that when patients understand the questionnaire and its purpose, they are more likely to engage in discussions about physical activity and health which can serve as a starting point for behavioral counseling and goal-setting.

As far as research-oriented implications are concerned, using validated, regionally translated tools supports uniform assessment practices across diverse clinical settings. It also enables consistent data collection for clinical audits, quality improvement, or integration with electronic health records. It might also help to bring about an increase in response rate and participant satisfaction, contributing to more representative samples. It might also help enable inclusion of underrepresented groups, especially those from rural or non-English-speaking background, thereby supporting multi-center studies and public health surveillance by allowing standardized data collection across various language groups. This in turn might provide policymakers with reliable, region-specific data to inform health programs, particularly in low-resource or linguistically diverse areas.

Key strengths of this study include the systematic translation and adaptation process incorporating forward-backward translation, expert review, and cognitive debriefing, as well as the validation of the questionnaire in individuals with metabolic syndrome. The involvement of both content experts and language experts ensured linguistic accuracy and conceptual equivalence of the translated instrument. Furthermore, the validated Marathi GPAQ has the potential to improve accessibility of physical activity assessment among Marathi-speaking populations.

The present study has certain limitations. First, the validity of the translated Marathi version was assessed

against the established English version of the GPAQ rather than an objective measure of physical activity, such as an accelerometer, which may provide more precise estimates of physical activity and sedentary behaviour. Second, as GPAQ is a self-reported questionnaire, the responses may be subject to recall bias and social desirability bias. And the participants for validation process were recruited using purposive sampling, which may limit the generalizability of the findings to the broader Marathi-speaking population with metabolic syndrome.

CONCLUSION

English terms related to physical activity may be unfamiliar to rural and elderly populations. The availability of a regional language version of the questionnaire may improve comprehension, participant engagement, and response accuracy. The findings from the translation and consensus process indicate that the Marathi version of the GPAQ achieved satisfactory linguistic equivalence and conceptual consistency with the original English questionnaire. Within the scope of the present study, the translated Marathi version demonstrated acceptable concurrent validity and reliability in individuals with metabolic syndrome. These findings support its use as a subjective tool for the assessment and surveillance of physical activity and sedentary behavior among Marathi-speaking populations.

Recommendations

Future studies can validate the translated Marathi version of GPAQ with robust methods like accelerometers, pedometers etc to understand the extent of under or over reporting of physical activity and sedentary behavior. Validation studies can also be aimed at assessing its reliability and validity in various conditions and patient population in Marathi speaking regions and communities employing probability-based sampling methods.

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