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Toward Regional Use of the General Practice Physical Activity Questionnaire (GPPAQ): Reliability and Validity of the Croatian Version

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Abstract

The General Practice Physical Activity Questionnaire (GPPAQ) is a brief tool aimed at screening physical activity levels in general medical practice, but reports on its reliability and validity in languages other than English are lacking. This study aimed to evaluate the applicability, reliability and validity of the Croatian version of the GPPAQ. The participants were 158 adults (40 males, 44.2±2.8 years of age) from Croatia who were tested on translated and culturally adapted version of the GPPAQ via a test–retest procedure. Additionally, the variables included sociodemographic data, health status, and results obtained via the International Physical Activity Questionnaire (IPAQ). The results revealed appropriate test–retest reliability of the Croatian version of the GPPAQ (ICC=0.71, 95% CI: 0.60–0.83; absolute agreement of 81%). No significant associations of the GPPAQ category with socioeconomic status, age, gender, or educational level were found. However, the activity level, as measured by the GPPAQ, was associated with the absence of chronic illness (Chi-square =9.11, $p<0.05$) and nonsmoking status (Chi-square =11.01, $p<0.05$). Finally, the GPPAQ category was positively correlated with the IPAQ score (Spearman's R=0.61, $p<0.05$). The Croatian version of the GPPAQ has acceptable test–retest reliability and proper validity, confirming its applicability as a measurement tool for physical activity in primary care in Croatia but also in surrounding countries.

Keywords: *psychometrics, test-retest reliability, adult, health behavior, family practice*

Introduction

Physical activity is widely recognized as one of the most effective preventive measures against a broad range of non-communicable diseases, including cardiovascular conditions, type 2 diabetes, obesity, and certain cancers (Augimeri et al., 2025; Drenjak, Pehar, Užičanin, Kontić, & Zenić, 2023; Ilić et al., 2024). According to the World Health Organization, insufficient physical activity is a leading risk factor for global mortality and contributes significantly to the overall burden of disease. In addition to its physical health benefits, regular activity is strongly associated with improved mental health, cognitive function, and overall quality of life. Despite these well-documented advantages, levels of physical inactivity remain alarmingly high worldwide, particularly in middle- and high-income countries (Ilić et al., 2024; Nikitara et al., 2021; Zhu et al., 2025).

The public health implications of physical inactivity have placed increasing pressure on healthcare systems to implement effective interventions aimed at promoting active lifestyles. Primary care settings offer a unique opportunity for early identification of at-risk individuals and for delivering tailored physical activity advice during routine consultations, with general practitioners often being the first point of contact in the healthcare system. This makes them strategically positioned to influence patients' health behaviors, including physical activity engagement. Indeed, primary care plays a critical role in the early detection and management of lifestyle-related health risks, including physical inactivity.

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General practitioners (GPs) are uniquely positioned to assess physical activity levels and deliver brief interventions that can lead to meaningful behavior changes (Kettle et al., 2022). Evidence shows that even short conversations initiated by healthcare professionals can significantly increase patients' motivation to become more physically active (Kettle et al., 2022; Ross, 2025). Moreover, patients often view GPs as trusted sources of health information, which enhances the credibility and potential impact of physical activity advice (Ladds, 2025; Wilson, Pollock, Weekes, & Dowell, 1995). However, physical activity assessment is underutilized in many primary care settings because of constraints such as limited consultation time, competing clinical priorities, and the lack of practical, standardized tools (Lowe et al., 2022; McKenna, Naylor, & McDowell, 1998). Addressing these barriers is essential for translating physical activity guidelines into real-world clinical practice. The implementation of efficient and reliable screening tools within primary care can enhance the systematic identification of physically inactive individuals. In this context, empowering GPs with validated and culturally appropriate assessment instruments becomes a key step toward promoting active lifestyles at the population level.

Accurately assessing physical activity is a crucial step in identifying individuals at risk and tailoring appropriate interventions, particularly within the constraints of primary care. Various assessment methods exist, ranging from objective measures such as pedometers and accelerometers to subjective, self-report questionnaires (Stelmach, 2018). While objective tools provide detailed and reliable data, their cost, complexity, and time requirements often limit their routine use in general practice (Campos, Vilar-Compte, & Gaitán-Rossi, 2018). In contrast, self-report questionnaires are practical, cost-effective, and easy to administer, making them well suited for busy clinical environments (Brkic et al., 2025). Several questionnaires have been developed to assess physical activity in adults, including the International Physical Activity Questionnaire (IPAQ), the Rapid Assessment of Physical Activity (RAPA), and the General Practice Physical Activity Questionnaire (GPPAQ) (Stelmach, 2018). These instruments vary in length, complexity, and the type of activity domains they cover (e.g., occupational, leisure, transport). However, despite their availability, not all tools are equally applicable across different populations and cultural contexts. Therefore, selecting or adapting a questionnaire that balances simplicity, validity, and contextual relevance is essential for effective integration into primary care practice.

The General Practice Physical Activity Questionnaire (GPPAQ) is a brief, self-administered tool specifically designed for use in primary care to assess adult physical activity levels (Heron, Tully, McKinley, & Cupples, 2014). Developed by the UK Department of Health, the GPPAQ categorizes individuals into four activity levels—active, moderately active, moderately inactive, and inactive—based primarily on occupational activity and weekly engagement in physical exercise. It was designed to be quick to complete, take less than one minute, and require minimal interpretation, making it highly practical for routine use during general practice consultations. The GPPAQ has been integrated into electronic health record systems in the UK and is endorsed as a standard assessment tool within the NHS physical activity care pathway. However, the tool has also faced some criticism for its limited coverage of activity domains beyond work and structured exercise, potentially underestimating the total activity of certain population groups (Stelmach, 2018). Despite its limitations, the GPPAQ remains one of the most feasible and widely adopted physical activity screening tools in general practice. Its brevity, ease of use, and minimal resource requirements allow it to be efficiently integrated into standard clinical workflows without disrupting consultation time (T. O. Smith et al., 2017). Furthermore, its compatibility with electronic health record systems enhances its potential for routine implementation at scale. Given these advantages, the GPPAQ stands out as a practical candidate for cross-cultural adaptation, particularly in healthcare settings where time and staffing constraints limit the feasibility of longer or more complex instruments. However, for the tool to be effectively used in non-English-speaking populations, it must undergo rigorous processes of translation, cultural adaptation, and psychometric validation.

Despite the growing emphasis on promoting physical activity within primary care, there is currently no validated Croatian version of the GPPAQ or similar tools specifically adapted for use in regions where similar languages (i.e., Serbian, Montenegrin, and Bosnian) are spoken. This gap presents a significant barrier to implementing standardized physical activity assessments in general practice across Croatia and other surrounding countries. Without proper translation and validation, the accuracy and reliability of the questionnaire may be compromised, leading to misclassification and inappropriate clinical decisions. Therefore, this study aimed to evaluate the reliability and validity of the GPPAQ for use in the Croatian primary care setting. The authors believed that validating the GPPAQ in the Croatian language would provide healthcare professionals with an evidence-based tool tailored to their patient population, enhancing the capacity for early identification of physical inactivity. Moreover, such a tool could facilitate regional comparisons, support public health surveillance, and strengthen intervention strategies targeting noncommunicable disease prevention. Initially, it was hypothesized that the Croatian version of the GPPAQ would be sufficiently reliable and valid.

Methods

Participants and study protocol

The participants in this study were 158 adults from southern Croatia (40 males, 44.2±2.8 years of age) from Split Dalmatia County in southern Croatia. Sample size was defined via the consensus-based Standards for the Selection of Health Measurement instruments (COSMIN) guidelines, which recommend that a minimum of 50 participants be tested to determine the quality of studies assessing the psychometric properties of the instruments (Mokkink, Elsman, & Terwee, 2024). The inclusion criteria for the study were as follows: age group (16--74); long-term and regular patient status of the appointed physician; and voluntary participation. The exclusion criteria were patients who were younger or older than the inclusion criteria, patients with poor cognitive ability, and patients with severe manifestations of acute disease (for example, COVID-19). The investigation was preapproved by the Ethical Board of the University of Split, Faculty of Kinesiology (EBO: 2181-205-02-05-24-019; date of approval, 11 September 2024). The study was conducted from September to November 2024. After ethical approval, one of the first authors of the study presented the aim and procedure of the study to the Union of Medical Doctors specializing in general medicine-general practitioners (GPs).

The physicians who agreed to participate in the study provided their support to one kinesiology student and one medical student. Both students were in the physician's office during working hours for 7 working days. The aim and purpose of the study were explained to each patient individually during patient visits. Only those patients who met the inclusion criteria and who voluntarily offered to participate were included in the study. Before data collection, patients were asked to provide written informed consent. Each patient was also asked to complete the same questionnaire again after a period of two to three weeks. To complete the survey again (retest), the respondents were not required to visit the GP's office. They received a reminder and a link to the survey via mobile phone (SMS) or email. In the first phase (test), 180 respondents voluntarily completed the questionnaire, while 160 took the retest, of which 2 did not meet the inclusion criteria.

Variables and testing

The variables included sociodemographic factors and physical activity levels. Sociodemographic variables included gender (male, female), age (in years), education level (elementary school, high school, college/university level), socioeconomic status (below average, average, above average), smoking habits (yes, no), and chronic illness (specified, but participants were later grouped into two groups: those with chronic health conditions and those with no health conditions).

Physical activity was evaluated via the GPPAQ (please see below for details), and the Croatian version of the International Physical Activity Questionnaire was validated (Brkic et al., 2025). The IPAQ is a widely used instrument to assess physical activity in populations. The participants were asked to recall the duration and frequency of physical over the last seven days. Careful instruction was given regarding the types of activities to include within each intensity category. The data were subsequently processed via the established IPAQ scoring protocol (Brkic et al., 2025).

The initial translation ("forward translation") from the original language to the Croatian language was made by two official translators, native Croatian speakers. The translators independently translated the original questionnaire. According to the recommendations for the most reliable translation, one translator was familiar with the concept that the questionnaire was intended to measure, whereas the other translator was not. Minor discrepancies in the translation between the initial translations were resolved by hiring an additional, independent bilingual translator who was not involved in the initial translation. The translated questionnaire, without insight into the original version of the questionnaire, was back-translated by a bilingual native English speaker. This translator was not informed about the research concept and had no formal medical training. The back-translation ensured the consistency of the translation. The English-translated versions were then compared with the original English versions. A team of experts corrected any linguistic errors until an acceptable translation was developed. Priory validation of the Croatian version of the GPPAQ preliminary test was performed on ten participants to identify grammatical and linguistic errors that could affect the understanding of the respondents. The GPPAQ in general consists of four sections, namely: occupational physical activity, physical exercise, duration and frequency, and mode of transport to work or main activity. The GPPAQ scoring system combines responses from the occupational activity and leisure-time physical activity sections to assign one of four overall activity categories: active, moderately active, moderately inactive, or inactive (see Table 1 for more details on queries). Scoring follows an algorithm that prioritizes both the intensity of work-related activity and the frequency of recreational exercise. Individuals reporting mainly sedentary work and little or no leisure activity are classified as inactive, whereas those engaging in regular moderate or vigorous activity—either through work or recreation—are categorized as active. The detailed scoring criteria and the full algorithm are described in the original GPPAQ user manual published by the UK Department of Health (2009). Since the GPPAQ categorizes participants into an activity group, for the purpose of this study, categories were numericized (inactive – 1, moderately inactive – 2, moderately active – 3, and active – 4). (National Health Service, 2025)

The online SurveyMonkey platform (SurveyMonkey Inc., San Mateo, CA, USA) was used for testing. For the purpose of evaluating the reliability of the Croatian version, the GPPAQ was administered twice, from 7--10 days between the first test (test) and second test (retest). The remaining variables were tested only once, the same time that the retest of the GPPAQ was performed.

Statistics

The Kolmogorov–Smirnov test was used to evaluate the normality of the distributions, and consequently, means and standard deviations were calculated for normally distributed variables (frequencies and percentages otherwise).

Test–retest reliability of the GPPAQ was evaluated by calculating the intraclass coefficient with the corresponding 95% confidence interval. Additionally, we reported absolute agreement between the test and retest results by calculating the percentage of the equally responded queries.

To test the validity of the GPPAQ, several procedures were performed. First, we calculated associations between sociodemographic variables and GPPAQ scores. The chi-square test ($\chi 2$) was used to define associations between sex, smoking prevalence, chronic illness, educational level, and the GPPAQ score. Additionally, Spearman's correlation was calculated between (i) age and the GPPAQ score and (ii) socioeconomic status and the GPPAQ score. Finally, to establish criterion validity, we calculated Spearman's correlation coefficient between the GPPAQ and IPAQ.

Statistica ver. 14.0 (Tibco Inc., Palo Alto, CA, USA) was used for all calculations, and a p-level of 95% was applied.

Results

Table 1 presents descriptive statistics for the GPPAQ and the percentage of equally responded queries at testing trials. The ICC coefficient revealed appropriate GPPAQ overall test–retest reliability (ICC=0.71, 95% CI: 0.60–0.83). Additionally, absolute agreement was sufficient, with 81% of the equally responded queries over the test and retest measurements. A somewhat lower percentage of the equally responded queries was provided for questions related to physical activity in free time (71%-80%), whereas higher agreement was evident for questions related to professional physical activity (98%). With respect to the GPPA classification, 17 participants (11%) were classified as "active", 62 participants (39%) were classified as moderately active, 53 participants (33%) as moderately inactive, and 27 participants (17%) as inactive.

Table 1. Descriptive statistics at retest (F–frequency; %–percentage), and absolute agreement - percentage of the equally responded queries across testing trials (test and retest) for the GPPAQ in Croatian adults

	F (%)	% of equal responses at test and retest
1. Which of the following best describes your work or main daily activities?		98%
I am not in employment (e.g., retired, student, unemployed, long-term sick leave)	17 (11)	
I spend most of my time sitting (such as in an office)	62 (39)	
I spend most of my time standing or walking (e.g., shop assistant, hairdresser, guard)	54 (34)	
My work involves definite physical activity (e.g., plumber, nurse, gardener)	23 (15%)	
My work involves vigorous physical activity (e.g., construction worker, farmer)	3 (2%)	
2. In your spare time, which of the following best describes the amount of physical activity you do?		80%
I have not done any physical activity in the last week	29 (18)	
I do some light activity (e.g., walking, gentle cycling)	27 (17)	
I do moderate activity (e.g., brisk walking, swimming)	48 (30)	
I do vigorous activity (e.g., running, competitive sport)	55 (35)	
3. How many hours of physical activity like walking, cycling, or sport do you do each week?		71%
None	129 (82)	
Less than 1 hour	7 (4)	
1–3 hours	16 (10)	
More than 3 hours	7 (4)	
4. How do you usually travel to and from work (or your main daily activities)?		75%
By car, bus, or train	4 (3)	
On foot	18 (11)	
By bicycle	42 (26)	
Other (specify)	95 (60)	

Figure 1 presents the distribution of the GPPAQ categories across several study variables. No significant associations were detected between gender (Figure 1A) or educational status (Figure 1B) and GPPA category ($\chi2$=4.17 and 12.56, p>0.05, respectively). There was a greater likelihood of being more physically active for participants who reported no chronic illness (Figure 1C) and those who did not smoke (Figure 1D) ($\chi2$=9.11 and 11.01, p<0.05, respectively).

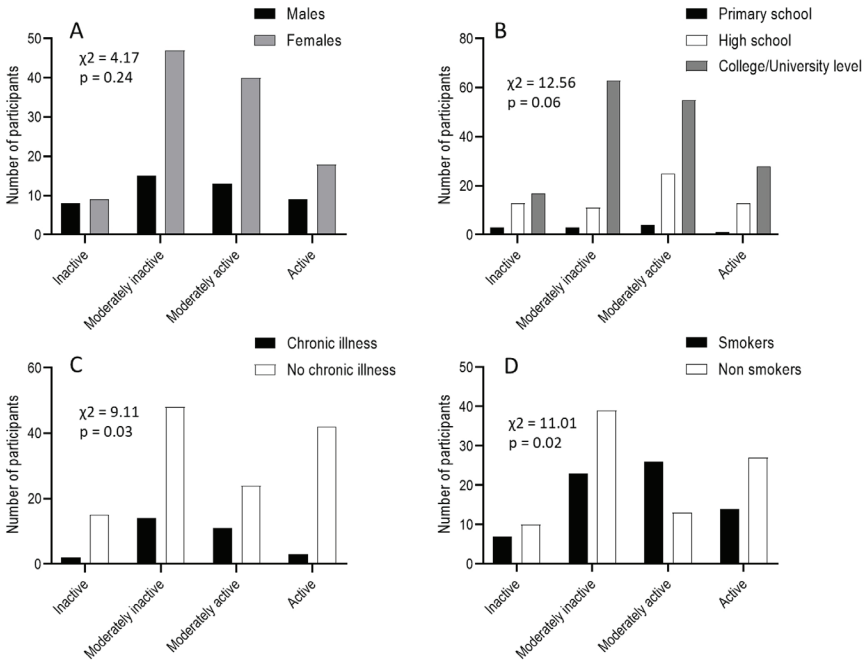

FIGURE 1. Distribution of the GPPAQ (General Practice Physical Activity Questionnaire) physical activity categories by gender (1A), education level (1B), chronic illness (1C), and smoking status (1D), with $\chi2$ differences

When socioeconomic status and age were correlated with the GPPAQ category, no significant associations were found (Spearman's R =-0.15 and -0.13, p>0.05, respectively). Moreover, the IPAQ score was significantly correlated with the GPPAQ score (Spearman's R =0.61, p<0.05) (Table 2).

Table 2. Spearman's rank correlation coefficients between socioeconomic status, IPAQ score, and GPPAQ physical activity categories (* denotes significant coefficients)

	Socioeconomic status	Age	IPAQ score	GPPA category
Socioeconomic status	-			
Age	-0.32*	-		
IPAQ score	0.18	-0.35*	-	
GPPAQ category	-0.15	-0.13	0.61*	-

Legend: GPPA – General Practice Physical Activity Questionnaire, IPAQ – International Physical Activity Questionnaire.

Discussion

There are two important findings of the study. First, reliability analyses revealed appropriate reliability of the Croatian version of the GPPAQ, with some differences in reliability coefficients for different questionnaire items. Second, the criterion-related validity of the translated and adapted versions of the GPPAQ was confirmed. Therefore, the initial study hypotheses can be accepted.

Reliability

Test-retest reliability is a fundamental psychometric property that reflects the stability and consistency of a measurement tool over time (Guttman, 1945). In the context of self-reported physical activity questionnaires, ensuring that respondents provide similar answers across repeated administrations under comparable conditions is critical for establishing the instrument's trustworthiness. Consistency over time is especially relevant in clinical practice, where treatment decisions and referrals may depend on repeated activity assessments. The appropriate test-retest reliability observed in the Croatian version of the GPPAQ supports its use in clinical and research settings, where repeated assessments may be needed to track behavior changes or intervention outcomes. Even though certain items demonstrated slightly lower coefficients than others did, all fell within acceptable thresholds, suggesting that the questionnaire performs reliably across its domains.

Although studies could not be found where the GPPAQ was tested for reliability in other languages, the overall reliability observed in this study aligns with results reported in previous evaluations of the GPPAQ in different populations. For example, in a validation study conducted among South Asian adults in the UK, the GPPAQ demonstrated moderate reliability and was found to be a feasible tool for categorizing physical activity levels in diverse cultural contexts (Williams, Stamatakis, Chandola, & Hamer, 2011). These findings mirror the pattern observed in the Croatian version, where some items presented slightly lower yet acceptable coefficients. Such variability underscores the influence of cultural and contextual factors on how physical activity is reported and interpreted.

In the present study, the highest test-retest reliability was observed for the "work activity" items of the GPPAQ, which is consistent with previous studies using the GPPAQ, which have also reported robust reliability for occupational activity components (T. O. Smith et al., 2017). There is no doubt that this finding is a result of the structured and stable nature of occupational roles, which typically remain unchanged over short periods such as the 7–10-day interval used in the design. For employed individuals, daily work-related physical activity tends to follow consistent patterns, whether sedentary, standing, manual, or heavy labor. This stability minimizes the likelihood of recall bias or true behavioral change between the test and retest. Consequently, responses in this domain reflect more enduring behavioral traits rather than transient or situational activity, contributing to higher reliability coefficients.

In contrast, the items related to "physical activities" outside of work (i.e., walking, cycling, and sports) showed comparatively lower test-retest reliability, although still within acceptable psychometric thresholds. This variability is likely attributable to the natural fluctuations in individuals' engagement in leisure-time physical activity between tests and retests. In particular, unlike occupational routines, physical activity during free time is influenced by multiple short-term factors, such as weather, energy levels, motivation, social obligations, and health status (Miljanovic Damjanovic et al., 2024; Park, Elavsky, & Koo, 2014). As such, a seven to then day interval between the test and retest can reasonably capture real changes in behavior rather than measurement error. Additionally, the subjective interpretation of what constitutes "moderate" or "vigorous" physical activity may differ between administrations. While this may slightly impact the test-retest correlation, it also reflects the ecological validity of the questionnaire in capturing real-world behavior. Therefore, while slightly lower reliability in this domain is not only acceptable but also expected, it reinforces the importance of clear item wording and possibly supplemental probing in clinical applications.

Validity

To assess validity, the associations between the GPPAQ score and sociodemographic variables were calculated. Interestingly, some associations were not statistically significant but still aligned logically with theoretical expectations, suggesting that the tool measures the intended construct without being overly sensitive to all demographic variations. The presence of both significant and theoretically consistent nonsignificant findings enhances confidence in the questionnaire's construct validity. This pattern is consistent with prior validation studies, where demographic trends often serve as indirect indicators of measurement accuracy. In further text, some specific results are discussed in more detail.

Smoking and the presence of chronic illness were negatively associated with GPPAQ scores, findings that provide meaningful support for the questionnaire's validity. Individuals who reported regularly smoking or living with chronic conditions such as cardiovascular disease or dia-

betes tended to have lower physical activity scores, which aligns with well-established behavioral and clinical patterns (Kaczynski, Manske, Mannell, & Grewal, 2008; Zhang, Cao, Mo, & Feng, 2023). These results suggest that the GPPAQ effectively distinguishes individuals on the basis of known health-related risk factors associated with physical inactivity. These associations are consistent with findings in previous studies, where physical activity levels were inversely related to markers of poor health or high-risk lifestyle behaviors (Brawner, Churilla, & Keteyian, 2016; Cooper, Resor, Stoever, & Dubbert, 2007). The ability of the Croatian GPPAQ to reflect these known relationships reinforces its relevance as a screening tool for identifying patients who may benefit from physical activity interventions in primary care.

Interestingly, no significant correlation was found between the GPPAQ score and age, socioeconomic status or educational level in this study. While at first glance this may appear to challenge the questionnaire's sensitivity, the absence of statistical significance in these domains may actually reflect the complex and context-dependent nature of physical activity behaviors. In many populations, individuals across different age groups, income levels and education levels engage in similar patterns of physical activity due to occupational demands, lifestyle preferences, or environmental factors (Powell, Slater, & Chaloupka, 2004). Therefore, these nonsignificant results do not undermine the tool's validity; rather, they demonstrate that the questionnaire is not unduly biased by sociodemographic status and may be broadly applicable across diverse population groups.

As part of the validation process, the aim was to establish criterion validity by comparing the Croatian version of the GPPAQ with the Croatian version of the International Physical Activity Questionnaire (IPAQ). Since the GPPAQ is a brief screening tool, the authors believe it is important to evaluate how well it aligns with a more detailed and widely used instrument such as the IPAQ, which captures various domains and intensities of physical activity (Hallal & Victora, 2004; Lee, Macfarlane, Lam, & Stewart, 2011). This comparison was especially relevant given our intention to recommend the GPPAQ for use in busy primary care settings, where longer tools may not be feasible (B. J. Smith, Marshall, & Huang, 2005). By correlating the results of these two instruments, the intention was wanted to assess whether the GPPAQ could reflect physical activity patterns without requiring detailed time-based reporting. The approach allowed us to examine how much information might be retained when a shorter tool is used. While we do not expect the GPPAQ to replace comprehensive assessments, we believe that its utility lies in offering a quick, valid snapshot of a patient's activity level. For that reason, establishing a meaningful correlation with the IPAQ was a key step in our study.

In our study, the correlation coefficient between the Croatian versions of the GPPAQ and the IPAQ was 0.61, indicating a moderate but meaningful association between the two instruments (Post, 2016). While this correlation is not exceptionally high, it is in line with expectations given the differences in scope and structure between the questionnaires. The GPPAQ is designed as a short, pragmatic screening tool, focusing primarily on occupational activity and a limited range of leisure-time exercise (T. O. Smith et al., 2017). Moreover, the IPAQ captures multiple domains and intensities of activity in greater detail (Brkic et al., 2025; Hallal & Victora, 2004). Therefore, some degree of divergence between the two measures is both logical and unavoidable. Importantly, the significant correlation we observed provides evidence that the GPPAQ adequately reflects broader patterns of physical activity while still maintaining the efficiency required for use in primary care. Similar moderate correlations have been reported in validation studies of other brief activity questionnaires, reinforcing the idea that shorter tools can serve as reliable proxies when time and resources are limited (Stelmach, 2018). Overall, these findings support the criterion validity of the Croatian GPPAQ and confirm its potential as a practical alternative to longer instruments such as the IPAQ in everyday clinical practice.

Limitations and strengths

This study has several limitations that should be acknowledged. First, the sample was recruited from primary care settings in specific geographical regions with mild climates (southern Croatia), which may not fully represent the general population and could limit the generalizability of the findings. Second, physical activity was assessed exclusively through self-report measures, which are subject to recall bias and social desirability effects. Although we used the IPAQ as a criterion measure, the absence of objective tools such as accelerometers may have constrained the precision of our validation. Finally, the test-retest reliability was evaluated over a relatively short interval (7–10 days), which may not capture the longer-term stability of the responses.

Despite these limitations, the study also presents several notable strengths. This is the first attempt to translate, culturally adapt, and validate the GPPAQ for use in the Croatian language, addressing an important gap not only for Croatia but also in regional physical activity assessment. The study applied a systematic translation and back-translation process combined with expert review, ensuring both linguistic and conceptual accuracy. By including both test-retest reliability and criterion validity (via comparison with the IPAQ), we were able to assess the psychometric properties of the GPPAQ comprehensively. The study also benefited from a heterogeneous sample of primary care patients, which enhances the practical applicability of the findings.

Conclusion

This study demonstrated that the Croatian version of the GPPAQ has acceptable test–retest reliability, confirming its stability as a measurement tool for physical activity in primary care. While certain items presented slightly lower coefficients, all the results were within psychometrically acceptable ranges.

Validity testing further supported the Croatian GPPAQ as a robust tool. Significant negative associations with smoking and chronic illness confirmed its sensitivity to known risk factors, whereas nonsignificant results with education and socioeconomic status highlighted its applicability across diverse groups in Croatia.

Criterion validity was confirmed by the moderate but meaningful correlation between the GPPAQ and the Croatian IPAQ. Although the correlation was not strong, this was expected given the differences in length and scope between the tools. Importantly, the observed associations indicate that the GPPAQ can serve as a practical alternative to more detailed questionnaires when time and resources are limited.

Future studies should explore the long-term reliability of the Croatian GPPAQ over extended intervals and across diverse population groups. Additional validation against objective measures such as accelerometers would further strengthen its psychometric profile. Expanding cross-cultural comparisons within the broader South Slavic language region could also enhance its applicability and support regional public health initiatives.

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Conflicts of interest
The authors declare no conflict of interest.

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References

Augimeri, G., Lofaro, D., Vivacqua, A., Barone, I., Giordano, C., Morelli, C., . . . Bonofiglio, D. (2025). Associations among skin carotenoids, anthropometric parameters and healthy lifestyle behaviors in young adults: a cross-sectional, population-based study. *Journal of Translational Medicine, 23*(1), 952. https://doi.org/10.1186/s12967-025-06978-2

Brawner, C. A., Churilla, J. R., & Keteyian, S. J. (2016). Prevalence of physical activity is lower among individuals with chronic disease. *Medicine and Science in Sports and Exercise, 48*(6), 1062-1067. https://doi.org/10.1249/MSS.0000000000000861

Brkic, S., Gilic, B., Obradovic Salcin, L., Ostojic, D., Ostojic, L., Miljanovic Damjanovic, V., . . . Sekulic, D. (2025). Analysing the association of BMI, physical activity and sociodemographics with osteoarthritis symptom severity: cross-sectional study in Southern Bosnia and Herzegovina. *BMJ Open, 15*(9), e092849. https://doi.org/10.1136/bmjopen-2024-092849

Campos, A. P., Vilar-Compte, M., & Gaitán-Rossi, P. (2018). Comparison of Subjective and Objective Methods for Measuring Physical Activity in Urban Mexican Older Women. *Journal of Aging & Social Change, 8*(4). https://doi.org/10.18848/2576-5310/CGP/v08i04/17-29

Cooper, T. V., Resor, M. R., Stoever, C. J., & Dubbert, P. M. (2007). Physical activity and physical activity adherence in the elderly based on smoking status. *Addictive Behaviors, 32*(10), 2268-2273. https://doi.org/10.1016/j.addbeh.2007.01.007

Drenjak, J. L., Pehar, M., Užičanin, E., Kontić, D., & Zenić, N. (2023). Physical activity, sport participation, and cigarette smoking in university students after COVID-19 pandemic; Cross sectional analysis of the associations in south-eastern Europe. *Montenegrin Journal of Sports Science and Medicine, 12*(1), 61-68. https://doi.org/10.26773/mjssm.230308

Guttman, L. (1945). A basis for analyzing test-retest reliability. *Psychometrika, 10*(4), 255-282.

Hallal, P. C., & Victora, C. G. (2004). Reliability and validity of the international physical activity questionnaire (IPAQ). *Medicine & Science in Sports & Exercise, 36*(3), 556. https://doi.org/10.1249/01.mss.0000117161.66394.07

Heron, N., Tully, M. A., McKinley, M. C., & Cupples, M. E. (2014). Physical activity assessment in practice: a mixed methods study of GPPAQ use in primary care. *BMC Family Practice, 15*(1), 11. https://doi.org/10.1186/1471-2296-15-11

Ilić, P., Katanic, B., Hadzovic, M., Rakočević, R., Bjelica, D., & Mekic, A. (2024). Barriers to Physical Activity (PA) in the Working Population: A Review. *Sport Mont, 22*(1), 129-136. https://doi.org/10.26773/smj.240218

Kaczynski, A. T., Manske, S. R., Mannell, R. C., & Grewal, K. (2008). Smoking and physical activity: a systematic review. *American Journal of Health Behavior, 32*(1), 93-110. https://doi.org/10.5555/ajhb.2008.32.1.93

Kettle, V. E., Madigan, C. D., Coombe, A., Graham, H., Thomas, J. J., Chalkley, A. E., & Daley, A. J. (2022). Effectiveness of physical activity interventions delivered or prompted by health professionals in primary care settings: systematic review and meta-analysis of randomised controlled trials. *BMJ, 376*. https://doi.org/10.1136/bmj-2021-068465

Ladds, E. (2025). Exploring the GP-patient relationship: a historical narration. *Medical Humanities, 51*(1), 112-122. https://doi.org/10.1136/medhum-2024-012916

Lee, P. H., Macfarlane, D. J., Lam, T. H., & Stewart, S. M. (2011). Validity of the international physical activity questionnaire short form (IPAQ-SF): A systematic review. *International Journal of Behavioral Nutrition and Physical Activity, 8*(1), 115. https://doi.org/10.1186/1479-5868-8-115

Lowe, A., Myers, A., Quirk, H., Blackshaw, J., Palanee, S., & Copeland, R. (2022). Physical activity promotion by GPs: a cross-sectional survey in England. *BJGP Open, 6*(3). https://doi.org/10.3399/BJGPO.2021.0227

McKenna, J., Naylor, P., & McDowell, N. (1998). Barriers to physical activity promotion by general practitioners and practice nurses. *British Journal of Sports Medicine, 32*(3), 242-247. https://doi.org/10.1136/bjsm.32.3.242

Miljanovic Damjanovic, V., Obradovic Salcin, L., Ostojic, D., Ostojic, L., Gilic, B., Geets Kesic, M., . . . Sekulic, D. (2024). Exploring Factors Associated with Physical Activity in the Elderly: A Cross-Sectional Study during the COVID-19 Pandemic. *Behavioral Science (Basel), 14*(1). https://doi.org/10.3390/bs14010062

Mokkink, L. B., Elsman, E. B., & Terwee, C. B. (2024). COSMIN guideline for systematic reviews of patient-reported outcome measures version 2.0. *Quality of Life Research, 33*(11), 2929-2939. https://doi.org/10.1007/s11136-024-03761-6

Nikitara, K., Odani, S., Demenagas, N., Rachiotis, G., Symvoulakis, E., & Vardavas, C. (2021). Prevalence and correlates of physical inactivity in adults across 28 European countries. *European Journal of Public Health, 31*(4), 840-845. https://doi.org/10.1093/eurpub/ckab067

Park, C.-H., Elavsky, S., & Koo, K.-M. (2014). Factors influencing physical activity in older adults. *Journal of Exercise Rehabilitation, 10*(1), 45. https://doi.org/10.12965/jer.140089

Post, M. W. (2016). What to do with "moderate" reliability and validity coefficients? *Archives of Physical Medicine and Rehabilitation, 97*(7), 1051-1052. https://doi.org/10.1016/j.apmr.2016.04.001.

Powell, L. M., Slater, S., & Chaloupka, F. J. (2004). The relationship between community physical activity settings and race, ethnicity and socioeconomic status. *Evidence-Based Preventive Medicine, 1*(2), 135-144.

Ross, M. H. (2025). Critically appraised paper: Adding healthy lifestyle management to guideline-based care improves disability for low back pain [synopsis]. *Journal of Physiotherapy*. https://doi.org/10.1016/j.jphys.2025.05.005

National Health Service (2025). *General practice physical activity questionnaire (GPPAQ)*. Retrieved from: https://www.gov.uk/government/publications/general-practice-physical-activity-questionnaire-gppaq

Smith, B. J., Marshall, A. L., & Huang, N. (2005). Screening for physical activity in family practice: evaluation of two brief assessment tools. *American Journal of Preventive Medicine, 29*(4), 256-264. https://doi.org/10.1016/j.amepre.2005.07.005

Smith, T. O., McKenna, M. C., Salter, C., Hardeman, W., Richardson, K., Hillsdon, M., . . . Jones, A. P. (2017). A systematic review of the physical activity assessment tools used in primary care. *Family Practice, 34*(4), 384-391. https://doi.org/10.1093/fampra/cmx011

Stelmach, M. (2018). Physical activity assessment tools in monitoring physical activity: the Global Physical Activity Questionnaire (GPAQ), the International Physical Activity Questionnaire (IPAQ) or accelerometers–choosing the best tools. *Health Problems of Civilization, 12*(1), 57-63. https://doi.org/10.5114/hpc.2018.74189

Williams, E. D., Stamatakis, E., Chandola, T., & Hamer, M. (2011). Assessment of physical activity levels in South Asians in the UK: findings from the Health Survey for England. *Journal of Epidemiology & Community Health, 65*(6), 517-521. https://doi.org/10.1136/jech.2009.102509

Wilson, A. E., Pollock, C., Weekes, T., & Dowell, A. (1995). Can general practice provide useful information?--evaluation of a primary health care information project in northern England. *Journal of Epidemiology & Community Health, 49*(3), 227-230. https://doi.org/10.1136/jech.50.4.383

Zhang, J., Cao, Y., Mo, H., & Feng, R. (2023). The association between different types of physical activity and smoking behavior. *BMC Psychiatry, 23*(1), 927. https://doi.org/10.1186/s12888-023-05416-1

Zhu, M., Xu, S., Li, Y., Wang, W., Liu, L., Xu, Q., . . . Liu, Y. (2025). Global burden of non-communicable diseases attributable to behavioral factors. *Science Bulletin*. https://doi.org/10.1016/j.jare.2025.09.022