Validity of the Global Physical Activity Questionnaire in Older Adults With Chronic Obstructive Pulmonary Disease: Results From the National Health and Nutrition Examination Survey

Shweta Gore, PT, DPT, PhD, GCS;[1] Allon Goldberg, PT, PhD;[2] Min H. Huang, PT, PhD, NCS;[2] Michael Shoemaker, PT, PhD, GCS;[3] Jennifer Blackwood, PT, PhD, GCS[2]

[1]Department of Physical Therapy, School of Health and Rehabilitation Sciences, MGH Institute of Health Professions, Boston, MA
[2]Department of Physical Therapy, College of Health Sciences, University of Michigan-Flint, Flint, MI
[3]Department of Physical Therapy, College of Health Professions, Grand Valley State University, Grand Rapids, MI

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Purpose: The Global Physical Activity Questionnaire (GPAQv2) is widely used and one of the only national surveillance measures recommended by the World Health Organization for physical activity (PA) assessment globally. No studies to date have examined the validity of GPAQv2 in older adults with chronic obstructive pulmonary disease (COPD). This observational study examined its construct validity using population-based data. **Methods:** Individuals aged 65 years and older with COPD, interviewed in the National Health and Nutrition Examination Survey (NHANES) between years 2007 and 2012 were included. GPAQv2-derived PA was compared with constructs of lung function, shortness of breath, and the diagnosis of COPD. **Results:** The GPAQv2 was not found to be a significant predictor of COPD status (odds ratio = 1.00, 95% confidence interval: 0.99, 1.00) when controlling for relevant covariates. Age and smoking status emerged as the strongest predictors of COPD. Total PA was neither significantly associated with shortness of breath nor lung function. **Conclusions:** Older adults with chronic conditions such as COPD represent a unique subset of population discrete from the healthier counterparts. Given the importance of GPAQv2 as the only widely accepted population surveillance tool, future studies exploring its validity in this subset of individuals with COPD using different constructs and objective reference standards are needed. **(Cardiopulm Phys Ther J. 2020;31:159–166)**

Key Words: chronic lung disease, questionnaires, validation, physical activity

Correspondence: Shweta Gore, PT, DPT, PhD, GCS, Department of Physical Therapy, School of Health and Rehabilitation Sciences, MGH Institute of Health Professions, Charlestown Navy Yard, 36, 1st Avenue, Boston, MA 02129 (sgore@mghihp.edu).

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INTRODUCTION

Chronic obstructive pulmonary disease (COPD) has been identified as the third leading cause of death in the United States.[1–3] Chronic obstructive pulmonary disease has been predicted to become the fifth leading cause of disability by the year 2020.[4] The disability found in individuals with COPD is largely associated with their sedentary lifestyle, as they are notably less active as compared to those without the disease.[2,3,5] As compared to healthy older adults, individuals with COPD have 40% to 60% lower activity levels.[5–7] Inactivity in COPD is found even in the early stages of the disease and declines as the disease severity worsens, with individuals on long-term oxygen therapy demonstrating a further decline in activity levels.[7,8] The disabling symptoms of COPD including dyspnea, peripheral and respiratory muscle dysfunction, along with age-related declines in endurance, result in activity limitations, and a high proportion of sedentary time.[8–10] Lower levels of activity, in turn, result in further muscle weakness and deconditioning.[6] Physical inactivity found in COPD has been shown to be a poor prognostic indicator in the disease course and is associated with increased risk of hospitalization and death.[11,12]

Physical activity (PA), however, has been identified as a major independent, modifiable risk factor that has a protective effect on important health outcomes including functional status, lung function, risk of acute exacerbations, hospitalization, and even death in individuals with COPD.[5–7,11–16] For these reasons, improving PA is recognized by the Global Initiative for Chronic Obstructive Lung Disease (GOLD) as a critical goal in the management of COPD.[8,17] To accomplish this goal, assessment of PA using valid and reliable measures is imperative. Considering the impact of low PA levels toward increased burden of chronic disease, premature death, and associated health care costs, initiatives to monitor population levels of PA using standardized measures have been identified as a national health priority and an important component of public health practice.[18,19]

Various methods have been used to quantify PA levels in clinical and research settings. These methods range from simple self-reported questionnaires or activity logs to more complex accelerometers and laboratory methods such as indirect calorimetric methods.[9,10,20–22] Because of their relatively low cost, higher clinical utility, and low burden on participants, subjective measures are currently a practical choice for PA assessment.[23] Subjective PA assessments are therefore widely used in the surveillance of PA in large population groups and form an important part of global health initiatives.[17]

Of the various subjective PA measures available, the Global Physical Activity Questionnaire version 2 (GPAQ v2) is one of the most commonly used questionnaires in population-based surveillance systems. The GPAQv2 has been recommended by the World Health Organization (WHO) for the national surveillance of PA in healthy population across countries.[24] The GPAQ was developed by the WHO in 2002 as part of the WHO STEPwise approach to surveillance (STEPS).[25,26] The GPAQv2 was designed to compare regional and global differences in PA levels, to inform decisions about PA policy and to address the limitations of the only other available national surveillance measure, the International Physical Activity Questionnaire (IPAQ).[17,27–29] The long form of IPAQ was considered too lengthy and complex to be used as a surveillance measure.[17] The short form of IPAQ was found to largely overestimate PA and did not allow for differentiation of data from different PA domains.[17,28] The GPAQv2 is an interviewer-assisted questionnaire designed to provide an estimate of PA in major domains of activity.[27]

Because the GPAQv2 was designed and has been used as a surveillance tool of PA, nationally and internationally, it is important that the validity of this tool be explored.[30] Despite its widespread use, the validity of GPAQv2 in older adults with COPD has not been studied. Using GPAQv2 as a population-based surveillance measure in people with COPD without first examining its measurement properties in this population subset may result in an overestimation or underestimation of PA. Therefore, the purpose of this study was to examine the construct validity of the GPAQv2 in a large population-based cohort of older adults with COPD.

METHODS

Study Design and Participants

The study was approved by the Institutional Review Board at the primary investigator's institution. This observational cohort study used publicly available secondary data from the National Health and Nutrition Examination Survey (NHANES). The NHANES is a cross-sectional, multistage, stratified, clustered probability sample of civilian, noninstitutionalized, US populations conducted by the National Center for Health Statistics with oversampling of ages over 60 years, low-income groups, African Americans, and Mexican Americans.[31] The NHANES uses standardized interviews and physical examinations that are conducted in participants' homes and mobile medical centers through trained professionals to collect demographic and clinical information from participants.[31]

Inclusion and Exclusion Criteria. All noninstitutionalized community-dwelling individuals, aged 65 years and older who participated in the NHANES survey from year 2007 to 2012 were included in this study (Fig. 1). Individuals with COPD were identified as those who reported to have physician diagnosed emphysema or chronic bronchitis or both, and/or those who demonstrated a spirometry postbronchodilator-forced expiratory volume in the first second to forced vital capacity (FEV1/FVC) ratio less than 0.70.[32]

Instruments

GPAQv2. The GPAQv2 is an interviewer-based questionnaire and is composed of 16 questions assessing PA in 3 domains including work (n = 6), transport (n = 3), and leisure (n = 6) as well as the time spent in sedentary behavior (n = 1) in a typical week. The GPAQv2 takes about 5 minutes to administer and classifies PA according to intensity levels including moderate, vigorous, and inactivity. The interviewer asks participants to determine intensity of PA based on the increase in heart rate or breathing (small or large increase) caused by PA. The work and leisure domains measure duration and frequency of PA

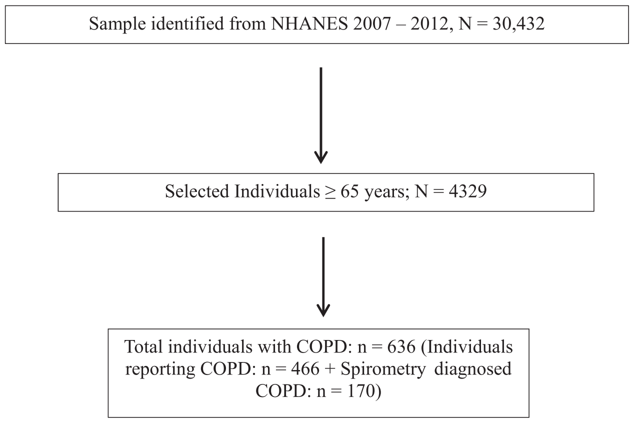

Figure 1. Participant flowchart.

at different intensities (moderate and vigorous), whereas the transport domain assesses duration and frequency of walking and cycling with no distinction between the activities based on intensity.[17,27,29] For each domain, the GPAQv2 assesses frequency (days per week) and the time spent in PA (minutes per week). The GPAQv2 guidelines indicate that compared with sitting quietly, a person's caloric consumption is 4 times as high when being moderately active, and 8 times as high when being vigorously active. Therefore, when calculating a person's overall energy expenditure using GPAQv2 data, 1 metabolic equivalent (MET) is assigned for inactivity, 4 METs for time spent in moderate activities, and 8 METs for the time spent in vigorous activities.[29]

Spirometry. Spirometry was performed to assess lung function parameters including FEV1 and FVC, using the Ohio 822/827 dry-rolling seal volume spirometers and following administration procedures recommended by the American Thoracic Society (ATS).[33] FEV1 was measured as the maximum volume of air expired in the first second, and FVC was measured as the maximum volume of air forcefully exhaled after a maximal inspiration.[34]

Procedures

Following identification of the sample, the demographic information including age, sex, body mass index (BMI), race, and household income was extracted. Potential confounding variables including self-report of current smoking status ("yes" or "no" response), shortness of breath ("yes" or "no"), other comorbidities including history of heart failure, coronary heart disease, heart attack or stroke ("yes" or "no"), and self-rated health (excellent, very good, good, fair, or poor) were extracted. In addition, participants with one or more of the individual cardiovascular comorbidities were grouped under the category of cardiovascular disease. Finally, information on specific lung function values (FEV1 and FVC) was also extracted from the data set. Information was considered as missing when the data were either missing, or where the individuals either refused to answer questions or did not know the answers.

The GPAQv2 data were extracted from the NHANES survey to assess the total weekly PA expressed in MET minutes per week. Scoring of GPAQv2 was performed according to the GPAQv2 analysis guide.[29] First, the total PA for different intensities across each individual domain (moderate-intensity work, moderate-intensity recreation, vigorous-intensity work, and vigorous-intensity recreation) over a week was calculated from the available data. For example, moderate-intensity PA for work was calculated by multiplying time spent in moderate-intensity work, frequency of moderate-intensity work, and 4METs. Similarly, vigorous-intensity PA for work was calculated by multiplying time spent in vigorous-intensity work, frequency of vigorous-intensity work, and 8METs. The PA of individual domains of different intensities was then added to create a new variable of total PA.[29]

Analysis. NHANES uses a complex survey design with oversampling of certain populations, where sample weights are assigned to individuals to create a sample that is representative of the American population. To account for this oversampling and ensuring an unbiased nationally representative sample, new population-based sampling weights were created before conducting further analyses. Analyses were performed using STATA version 15.0 (StataCorp LLC, College Station, TX).

Construct validity is defined as the ability of an instrument to measure an abstract concept and incorporates 3 main types: known-groups, convergent, and discriminant validity.[35] Known-groups validity is demonstrated when a test or questionnaire can discriminate between 2 groups known to differ on the variable of interest.[36] Convergent validity refers to "how closely the new instrument is related to other variables and other measures of the same construct."[37] Discriminant validity, however, ensures that the instrument or scale does *not* correlate with dissimilar, unrelated constructs.[37] A determination of all 3 is important to ensure that the scale is valid for the construct it proposes to measure.

Demographic and clinical characteristics between individuals with and without COPD were analyzed using *t*-tests for continuous and chi-square for categorical variables. Known-groups validity was examined by testing the ability of GPAQv2 to identify the presence or absence of COPD among all older adults included in the sample. Differences in the GPAQv2 PA scores were first compared between COPD and non-COPD groups using the unpaired *t* test. To account for potential confounding variables, a logistic regression model was then constructed with COPD (yes/no) as the dependent variable and total PA as the independent variable while controlling for other relevant covariates, including age, sex, race, BMI, history of cardiovascular disease including heart failure, coronary heart disease, and heart attack. In addition, a receiver-operating curve was plotted to determine the ability of GPAQv2 to detect presence or absence of COPD.

Convergent validity was assessed by examining associations between PA (GPAQv2 scores) and related constructs of PA in COPD identified from previous literature, including lung function and shortness of breath.[37] For this, associations between FEV1 and shortness of breath and GPAQv2-derived PA were examined using separate multivariable regression models adjusting for covariates including age, sex, race, BMI, smoking status, and history of cardiovascular disease. The variance inflation factor (VIF) was used to test multicollinearity, with an average VIF greater than 6 indicating evidence of multicollinearity. Collinearity was further examined using pairwise correlations between the independent variables, and associations between the outcome and each independent variable. If a correlation of $r > 0.4$ existed between any 2 independent variables, the variable which had a greater association with the outcome variable was selected in the model. The forced entry method of regression was used. Finally, we examined discriminant validity by examining associations between PA (GPAQv2 scores) and constructs unrelated to PA (household income) [35,38] using a logistic regression model with household income as the categorical dependent variable (annual household income less than 55,000 or more).

RESULTS

Of the 30,442 participants surveyed in the NHANES, 4329 were 65 years and older and 636 had COPD. The mean age of the sample was 73.32 ± 0.13 years (43.72% males, 79.92% non-Hispanic whites) (Table1). The COPD

TABLE 1

Comparisons of Demographic and Clinical Characteristics Between COPD and Non-COPD Participants

	Total Sample, N = 4329 Mean (SE) or N (%)	COPD, N = 636 Mean (SE) or N (%)	Non-COPD, N = 3693 Mean (SE) or N (%)	*P*
Age	73.32 (0.13)	72.15 (0.29)	73.56 (0.14)	<.001[b]
BMI[a]	28.57 (0.16)	29.19 (0.30)	28.44 (0.17)	.025[b]
FEV1[a]	2408.94 (60.98)	2381.22 (80.95)	2471.53 (107.46)	.531
FEV1/FVC[a]	0.66 (0.01)	0.64 (0.00)	0.73 (0.00)	<.001[b]
Total PA[a] (MET min/wk)	3091.58 (305.71)	2813.39 (295.97)	3148.59 (362.81)	.475
Total vigorous PA[a] (MET min/wk)	3633.00 (712.68)	2422.07 (337.44)	3945.70 (854.24)	.097
Total moderate PA[a] (MET min/wk)	2104.16 (214.10)	2074.67 (221.06)	2110.06 (256.57)	.920
Sedentary time[a] (min/d)	421.45 (17.37)	437.66 (33.41)	418.19 (19.06)	.597
Sedentary time[a] (hrs/d)	7.02 (0.29)	7.29 (0.56)	6.97 (0.32)	.597
Gender (m)	2114 (43.72)	344 (49.53)	1770 (42.55)	.028[b]
Race:				
Whites	2471 (57.08)	427 (67.13)	2044 (55.34)	
Blacks	806 (18.61)	94 (14.77)	712 (19.27)	
Hispanics	795 (18.36)	84 (13.20)	711 (19.25)	
Others	257 (5.93)	31 (4.87)	226 (6.11)	<.001[b]
Self-rated health[a]:				
Good or better	2625 (69.88)	346 (61.02)	2279 (71.46)	
Fair or poor	1131 (30.11)	221 (38.97)	910 (28.53)	<.001[b]
Shortness of breath[a] (y)	1581 (36.61)	394 (62.05)	1187 (32.23)	<.001[b]
Smoking[a] (y)	422 (19.04)	124 (0.26)	298 (16.98)	<.001[b]
Income[a]:				
<55,000	920 (23.49)	120 (20.58)	800 (24.00)	
>55,000	2995 (76.50)	463 (79.41)	2532 (75.99)	.053
CVD (y)	942 (21.76)	194 (30.50)	748 (20.25)	<.001[b]
HF[a] (y)	371 (8.65)	90 (14.15)	281 (7.61)	<.001[b]
MI[a] (y)	461 (10.68)	105 (16.5)	356 (9.68)	.002[b]
CHD[a] (y)	468 (10.93)	85 (13.68)	383 (10.46)	.053
Stroke[a] (y)	443 (10.27)	72 (11.36)	371 (10.09)	.563
Angina[a] (y)	261 (6.07)	66 (10.51)	195 (5.31)	.031[b]

[a]Variables with missing data.

[b]$P < .05$.

BMI, body mass index; CHD, coronary heart disease; COPD, chronic obstructive pulmonary disease; FEV1, forced expiratory volume in the first second; HF, heart failure; MI, heart attack; PA, physical activity; y, yes; m, male; MET min/wk, metabolic equivalent minutes per week.

group was younger and had higher BMI, lower FEV1/FVC ratios, higher percentage of smokers, greater shortness of breath, greater percentage of cardiovascular conditions, and poorer self-rated health (Table1).

Construct Validity

Known-Groups Validity. Of the total sample, 1999 participants had complete information on GPAQv2-derived PA and were included in regression analysis. A trend toward significant difference in the total vigorous PA was noted with lower overall vigorous activity in participants with COPD (absolute difference 1523.63 MET mins/week) (Table 1), however, no statistically significant differences between COPD and non-COPD groups based on the GPAQv2 scores. In addition, after controlling for relevant demographic and clinical covariates, the GPAQv2 was not found to be a significant predictor of COPD status, although a trend toward significance was noted (Table 2). Age, shortness of breath, and being a smoker emerged as the strongest predictors of COPD (Table 2). The GPAQv2 demonstrated poor ability in discriminating between those who had COPD versus those who did not with an area under the curve of 0.57 (sensitivity = 50.75%, specificity = 48.20%).

TABLE 2

Logistic Regression to Test the Ability of GPAQv2 PA[a] in Identifying the Presence or Absence of COPD

	Odds Ratio (95% CI)	*P*
GPAQv2 total PA (MET min/wk)	1.00 (0.99 to 1.00)	.080
Age	1.22 (1.05 to 1.43)	.010[b]
Gender	1.15 (0.29 to 4.60)	.844
Non-Hispanic white race	1.68 (0.37 to 7.54)	.492
BMI	1.01 (0.90 to 1.14)	.839
Self-rated health	0.39 (0.06 to 2.47)	.313
Current smoker	2.11 (1.16 to 3.83)	.015[b]
Shortness of breath	2.77 (1.79 to 4.30)	<.001[b]
History of CVD	0.52 (0.13 to 2.05)	.340
History of coronary heart disease	−0.18 (−0.77 to 0.41)	.541
History of heart attack	0.28 (−0.23 to 0.81)	.278

Overall model: $F_{(11, 35)} = 1.92$, $P = .07$.

[a]GPAQv2 derived PA (independent variable) in explaining the presence or absence of COPD (dependent variable).

[b]$P < .05$.

95% CI, 95% confidence interval; BMI, body mass index; CVD, cardiovascular disease; COPD, chronic obstructive pulmonary disease; MET min/wk, metabolic equivalent minutes per week; PA, physical activity.

Convergent and Discriminant Validity. Total PA, as measured with GPAQv2 was not significantly associated with either shortness of breath or FEV1, indicating a lack of convergent validity (Table 3). Age, male gender, shortness of breath, and belonging to the white race were found to be significant predictors of FEV1, whereas age and BMI were significant predictors of shortness of breath (Table 3). Further subgroup analyses revealed a statistically significant association of total vigorous PA with FEV1/FVC ratio {unstandardized beta 3.91^{-06} (95% confidence interval [CI] = 1.46^{-07}, 7.67^{-06}), $P = .042$}. However, the coefficients were too small to hold clinical significance. The GPAQv2 demonstrated a weak, nonsignificant association between total PA and annual household income (odds ratio = 1.00, 95% CI = 0.99, 1.00; $P = .666$) indicating evidence of discriminant validity. Table 3 provides details on the coefficients for individual predictors.

DISCUSSION

This study was the first to examine the construct validity of the GPAQv2 in a population-based cohort of older adults with COPD. FEV1[38–40] and shortness of breath[38–42] have both been reported to be significant predictors of PA in COPD. However, our results indicate that the GPAQv2 was unable to demonstrate associations with these variables and unable to predict COPD status despite a trend toward association between PA scores and shortness of breath.

Several explanations for these null findings are possible. The GPAQv2 calculates total PA using an equation that uses a summed score of frequency, time, and assigned MET values in the work and recreation domains, but not the transport domain.[29] For older individuals with limited work-related activities, consideration of the transport domain that included walking tasks in the calculation of total PA may have better reflected PA of this group. Although work domain included unpaid activities such as housework, it is possible that using the term "work-related activities" could have been confusing for the participants and may have limited their responses to activities related to paid work, thereby likely affecting the representation of their true weekly activity.

The representation of PA by GPAQv2 may also have been affected by the method of administration. The GPAQv2 uses subjective descriptors of activity (asking if participants engaged in activities that caused small or large increases in their breathing or heart rate). This subjective assessment of activity intensity is highly dependent on the participant's understanding and perception of heart rate and breathing responses, leading to a possibility of misclassification of PA. Use of a numeric scale to help participants understand the intensity may be more accurate. In addition, for those individuals who are deconditioned, even lighter forms of activity could result in large increases in ventilatory demand and, thereby, breathing response.

During subgroup analysis, participants with COPD who had spirometry data were further categorized according to severity based on the NHANES-published FEV1 reference values for different ethnic groups.[43] FEV1 values less than or equal to 30% of the predicted normal indicated very severe disease, ≥30% to ≤50% severe, ≥50% to ≤80% moderate, and ≥80% indicated mild disease according to previously published guidelines.[44] Most participants in this sample

TABLE 3

Regression Models Examining Associations Between PA Scores and Lung Function (FEV1), Shortness of Breath (SOB), and Household Income in Older Adults With COPD Using GPAQv2

Multiple Regression Examining Associations of PA Scores With FEV1		
	Overall Model: $R^{2a} = 0.674$, df = 35, $F_{(11, 25)} = 12.24$, $P < .001$	
FEV1	Unstandardized Beta (95% CI)	*P*
GPAQv2 total PA (MET min/wk)	−0.001 (−0.02 to 0.02)	.906
Age	−65.81 (−87.80 to −43.83)	<.001[b]
Male gender	1109.68 (828.31 to 1391.05)	<.001[b]
Shortness of breath (y)	−336.54 (−584.59 to −88.49)	.009[b]
Belonging to non-Hispanic white[b]race	746.20 (411.50 to 1080.90)	<.001[b]
Logistic Regression Examining Associations of PA Scores With SOB		
	Overall Model: $F_{(14, 32)} = 4.38$, $P = .003$	
SOB	Odds Ratio	*P*
GPAQv2 total PA (MET min/wk)	0.99 (0.99 to 1.00)	.668
Age	1.13 (1.01 to 1.25)	.028[b]
BMI	1.12 (1.03 to 1.21)	.011[b]
Logistic Regression Examining Associations of PA Scores With Household Income		
	Overall Model: $F_{(10,36)} = 2.28$, $P = .035$	
Household Income	Odds Ratio	*P*
GPAQv2 total PA (MET min/wk)	1.00 (0.99 to 1.00)	.666
Age	0.89 (0.81 to 0.97)	.013[b]
Gender	2.55 (1.12 to 5.77)	.026[b]
BMI	0.91 (0.83 to 0.99)	.026[b]
Smoking (y)	0.24 (0.08 to 0.72)	.013[b]

95% CI, 95% confidence interval; BMI, body mass index; COPD, chronic obstructive pulmonary disease; df, degrees of freedom; *P*, statistical significance; PA, physical activity; MET min/wk, metabolic equivalent minutes per week; y, yes.

[a]R^2 variance.

[b]$P < .05$.

belonged to the mild severity category (70.41%) with less than 1% individuals in the severe category. It is possible that the milder disease severity of the sample could have led to the inability of GPAQv2 to discriminate between COPD and non-COPD groups, and in that individuals with mild disease may self-limit PA that could decrease their ventilatory demand and breathing responses. Further research on examining validity of GPAQv2 in moderate to severe and severe COPD would be helpful in confirming this hypothesis. However, it should be noted that in the present sample of individuals with mostly mild COPD, dyspnea was significantly associated disease severity (FEV1) in this sample.

In addition, instead of using a specific week (previous week or day) to recall activities, the interviewer while administering GPAQv2 asks participants to provide PA levels based on a typical week or day of their lives. The nonspecific nature of questions may make recall more difficult increasing the possibility of underestimation or overestimation of findings. Other subjective PA measures have used several approaches to minimize recall errors by providing guided prompts to the participant, having participants recall activities in a segment of a specific day (segmented day format), or asking them questions about a specific week or day.[21,22] The lack of specificity of the day and absence of prompts by the interviewer may lead to poor recall, especially in older adults. Further research to compare the measurement properties of GPAQv2 in younger and older population is warranted to study the impact of recall errors.

Previous studies examining measurement properties of the GPAQv2 were performed on smaller younger and healthy samples with no known comorbidities and have shown inconsistent findings.[27,30,45,46] Because older adults with chronic conditions represent a unique subset of population, it is important that the validity of GPAQv2 be explored further in this specific subset to ensure accurate representation of PA in this population. This study provides preliminary data for future studies in this area.

Limitations

This study is not without limitations. First, it should be noted that although it would have been ideal if the present sample also included objective measures of PA against which the construct validity performance of the GPAQv2 could be compared, previous research has already clearly demonstrated the significant associations between both FEV1[38–40] and shortness of breath[38–42] and objective measures of PA in individuals with COPD. However, other constructs such as quality of life, self-efficacy, and exercise capacity have also demonstrated significant associations with PA,[3,11,38,40,47–50] and unfortunately, the NHANES data were limited in these constructs. The possibility of GPAQv2 relating better to functional measures of exercise capacity and quality of life rather than structural constructs such as the ones used in this study exists, and therefore, further research is needed to assess the validity of GPAQv2 against these related constructs. Also, because leisure-time PA has shown to be associated with health indicators such as decreased risk of cardiovascular events and with socioeconomic factors, such as income and education, examining the recreational domain alone may have provided additional information. However, because our aim was to examine the composite PA, we did not individually look at the recreational domain. Future research examining this domain would be worthwhile.

Finally, the NHANES data were limited in that the age at which these individuals were diagnosed with COPD was not known. Spirometry data may reflect pulmonary function at the time of initial diagnosis and not at the time of the study and may therefore explain why the sample seems to be predominantly those with milder COPD.

CONCLUSION

The GPAQv2 did not demonstrate construct validity in older adults in this sample population of older adults with COPD. Given the significance of GPAQv2 as a globally used population-based PA surveillance measure, further research is needed to assess the validity of GPAQv2 using other constructs of PA, in different age groups and COPD severity groups. This study will provide a foundation for similar studies in other chronic conditions in the older adult population.

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