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RESEARCH ARTICLE

VALIDATION OF THE RAPID ASSESSMENT OF PHYSICAL ACTIVITY QUESTIONNAIRE IN OLDER PATIENTS WITH CHRONIC OBSTRUCTIVE PULMONARY DISEASE

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ABSTRACT

Purpose: There are not many questionnaires that have proven validity and reliability in evaluating the level of physical activity in older patients with chronic obstructive pulmonary disease (COPD). In clinical and scientific studies, it is important to quickly determine the physical activity level of patients in terms of time management. The aim of the study was to examine the validity of the rapid assessment of physical activity (RAPA) questionnaire in older patients with COPD.

Methods: A total of 105 older patients with COPD surveyed the short form of the International Physical Activity Questionnaire (IPAQ-SF) and after 2 weeks RAPA questionnaire as well. The IPAQ-SF was accepted as the gold standard for physical activity assessment in COPD. Furthermore, patients were assessed for a 6-min walking test (6MWT) and perceived dyspnea (with modified medical research dyspnea scale (mMRC)). Correlation coefficients (r) was used for the relationship between RAPA and IPAQ-SF.

Results: There were significant positive correlations between RAPA and IPAQ-SF total score ($r = 0.968$, $p< 0.001$), 6MWT ($r = 0.626$, $p< 0.001$), in addition to significant negative correlation between the RAPA and mMRC scores ($r = -0.454$, $p< 0.001$). The RAPA showed good sensitivity (87.5%) and a specificity (100%) value. Positive and negative predictive values of the RAPA were 100% and 96.4% respectively.

Conclusion: This study showed the RAPA was an easy-to-use, valid, and reliable questionnaire to measure physical activity levels in older patients with COPD.

Keywords: Chronic Obstructive, Pulmonary Disease, Physical activity, Assessment, Questionnaire

INTRODUCTION

The sedentary lifestyle increases mortality, thus, physical activity which is defined as "any body movement that results from skeletal muscle contraction and increases energy consumption above the person's basal level" is an important parameter in clinical evaluations (1, 2). Physical inactivity is a serious risk factor in diseases such as metabolic disorders, cardiovascular diseases, and certain types of cancer (3). It has been proven through studies that different chronic diseases can be delayed or prevented by of physical activity (2). Reduced

physical activity in patients diagnosed with chronic obstructive pulmonary disease (COPD) has been shown to increase hospitalization rates and shorten the life span (4, 5). Because of this relationship between activity level and health, the amount and intensity of physical activity in daily life is important (6).

Patients diagnosed with COPD often have symptoms such as dyspnea and fatigue, which lead to functional insufficiency. Severe patients diagnosed with COPD have dyspnea even when performing simple activities in daily life (7). For this reason, the limited level of physical activity might reflect the symptoms such as dyspnea and fatigue in patients with COPD. Moreover, inactivity contributes to the worsening of the physical condition and even more dyspnea. This brings out a vicious cycle of inactivity and dyspnea (8, 9). Regarding this "COPD vicious cycle", the Global Obstructive Lung Disease Initiative (GOLD) report states "these problems have complex interrelationships". Moreover, it is stated that "any improvement within these interrelated processes can stop the vicious cycle in COPD (8). For this reason, the interventions that lead to improvements in daily physical activity have potential to break this vicious circle (10, 11). Therefore, it is critical to determine the level of physical activity in terms of clinically approaches.

The level of physical activity has assessed for a long time to understand social, environmental, and individual factors that allow or hamper physical activity (12). There are some questionnaires that have been validated to determine physical activity level in patients with COPD (13-15). However, the Rapid Assessment of Physical Activity questionnaire (RAPA) is faster than questionnaires that used to determine the physical activity level in patients with COPD. In fact, it is used to quickly determine the physical activity level of individuals over the age of 50 years (16, 17). Since COPD develops slowly and usually diagnosed after 50 years of age (18), it could be useful for the determination of physical activity level in older patients with COPD. The aim of this study was to examine the validity of the RAPA in older patients with COPD.

MATERIALS AND METHODS

After the ethics committee's approval, patients diagnosed with mild-to-moderate COPD according to GOLD criteria and followed up by Dokuz Eylul University Chest Diseases Clinic were included (8). Patients were excluded if they were clinically unstable, not having stopped smoking at least one year, had an acute exacerbation and/or any change in medication in the last 3 months. Patients with any other pulmonary, orthopaedic, and neurological disease were also excluded.

In validation studies, it was recommended the minimum ratio of the subject-to-item should be at least 10:1 (19) (e.g., required fifty subjects for a 5-item questionnaire). Although the required sample size was calculated at least 70 subjects because that RAPA 1 aerobic has 7 items, to increase the power the sample size was recalculated as 105 participants by taking the subjects per item ratio of 15:1.

RAPA

RAPA is a self-conducted questionnaire that determines the level of physical activity and includes 9 items with a double answer option of yes or no. In addition to the first 7 items that measure the level of physical activity, 2 items measure strength and flexibility. Therefore, the first 7 items are defined as RAPA 1 aerobic and the last 2 items are defined as RAPA 2 strength & flexibility, which only assesses the strength and flexibility and not considered in the total score (16, 17). The question with the highest scoring "yes" answer indicates the level of physical activity for RAPA 1 aerobics (17). The RAPA have 69% sensitivity (SENS), 81% specificity (SPEC), 75% negative predictive (NPV), and 77% positive predictive (PPV) values (17). Turkish adaptation and validity and reliability studies were performed in healthy individuals (16).

International Physical Activity Questionnaire-Short Form (IPAQ-SF)

IPAQ-SF is used as comparable and standardized self-reporting measure of the usual physical activities in different countries and socio-cultural contexts. The short form is designed to be used in time limited surveillance studies and consists of 8 items to estimate the last 7 days of physical activity together with the sedentary time (20). The sum of the duration and frequency of some types of physical activities gives a total score as "Metabolic Equivalent of Task (MET) - minute/week." The patients, who without at least 600 MET-minutes/week, were considered as inactive. IPAQ-SF validity and reliability were performed in COPD (21).

Dyspnea

The Modified Medical Research Council Dyspnea Scale (mMRC) was used to evaluate perceived dyspnea severity in daily living. It is a five-item scale that assess the general dyspnea based on a variety of physical activities. Patients were asked to mark their level of dyspnea. Grade 0 indicated the level without dyspnea, while Grade 4 indicated the highest level of dyspnea (22).

Exercise Capacity

It was determined with the six-minute walk test (6MWT). The 6MWT was performed using the methodology specified by previously defined standardisation criteria (23). The patients were instructed to walk as far as possible for 6 minutes. The test was performed in a continuous 30-meter flat, long, covered corridor. Heart rate, blood pressure, dyspnea level and oxyhemoglobin saturation were determined before and after the test. At the end of the test, the maximum walking distance was calculated.

Statistical Analysis

The patient characteristics were defined by descriptive statistics. Descriptive statistical tests were performed for all the recorded variables, and the data were expressed as median (interquartile range), percentage (%) or mean with standard deviation (mean ± SD). Statistical analyses performed using the IBM Statistical Package for Social Sciences (SPSS Inc.; Chicago, IL, USA) software for Windows version 20.1. A p value ≤ 0.05 at 95% was considered as significant.

Negative and positive predictive values, specificity and sensitivity of the RAPA were assessed after both IPAQ-SF and RAPA scores were categorized as active or passive separately to define the physical activity. The inter-rater reliability between the two questionnaires was assessed with the Cohen's kappa coefficient (κ) and interpreted according to ranges published before (24).

Validity Analysis

Patients completed the RAPA questionnaire 2 weeks after completing the IPAQ-SF, which was accepted as the gold standard for physical activity assessment in COPD. Furthermore, patients were assessed for perceived dyspnea and the 6MWT were calculated. Statistically positive correlations show the convergent validity, while negative correlations show the discriminant validity (25). The construct validity was assessed according to correlation (r) analysis between the RAPA 1 aerobic and IPAQ-SF, 6MWT, mMRC score and IPAQ-SF sitting time. The validity was considered as acceptable if the r value was more than 0.6 (16).

Table 1. Characteristics of the patients

	Mean	SD
Age (years)	64.68	8.43
Height (m)	1.71	0.07
Weight (kg)	82.03	15.00
Body mass index (kg/m2)	27.97	5.27
mMRC	1.63	1.02
6MWT	394.17	96.59
Smoking history (pack.years)	37.23	23.60
	n	*%*
Gender		
Female	33	31.43
Male	72	68.57
Level of education		
Secondary school	12	11.43
High school	30	28.57
University	63	60

Variables are presented as mean with standard deviation (SD), or percentage (%). **mMRC:** Modified Medical Research Council dyspnea scale; **6MWT:** 6 min-walk test.

Table 2. Physical activity levels of the patients according to two physical activity questionnaires

	n	%
IPAQ-SF		
Active	21	20
Inactive	84	80
RAPA 1 aerobic		
Sedentary	24	22.86
Underactive	15	14.29
Regular underactive (light activities)	15	14.29
Regular underactive	27	25.71
Regular active	24	22.85
RAPA 2 strength & flexibility		
Strength training	3	2.86
Flexibility training	6	5.71
Both	0	0
None	96	91.43

Variables are presented as n and percentage (%). IPAQ-SF: International Physical Activity Questionnaire-Short Form; RAPA: Rapid Assessment of Physical Activity.

RESULTS

Characteristics of the patients

A total of 105 patients over the age of 50 participated in the study. The characteristics of the patients are presented in Table 1. According to RAPA 1 aerobic, 22.85 % of patients were regularly active. Most of the patients stated that they did not do any training related to strength and/or flexibility. Besides, according to IPAQ, 80 % of the patients were inactive. The physical activity levels of the patients presented in Table 2.

Validity

There was a very strong positive correlation between RAPA 1 aerobic and IPAQ-SF total score ($r=0.968$, $p<0.001$), in addition to a strong positive correlation between RAPA 1 aerobic and 6MWT ($r=0.626$, $p<0.001$). There was also a strong negative correlation between RAPA 1 aerobic and IPAQ-SF sitting time ($r=-0.602$, $p<0.001$), in addition to a moderate negative correlation between the RAPA 1 aerobic and mMRC score ($r= -0.454$ $p<0.001$). These results showed that the convergent and discriminate validity (together construct validity) of RAPA were acceptable for older patients with COPD (Table 3).

Sensitivity, Specificity, Predictive Values, and Inter-Rater Reliability

The RAPA showed 100% SPEC, 87.5% SENS 87.5%, 100% PPV and 96.4% NPV in older patients with COPD. The Cohen's kappa coefficient (κ) was calculated as 0.915.

DISCUSSION

This study evaluated the reliability and validity of the RAPA questionnaire, which is a self-administered physical activity questionnaire, in patients diagnosed with COPD by means of the comparison with the IPAQ-SF. The RAPA is very easy to use as a physical activity questionnaire. The following strategies were used to assess the validity of the RAPA questionnaire: (a) positive correlations that were statistically significant between RAPA 1 aerobic and IPAQ-SF in addition to RAPA 1 aerobic and 6MWT values; (b) a negative correlation that were statistically significant between RAPA 1 aerobic and mMRC scores in addition to RAPA 1 aerobic and sitting time of IPAQ-SF; (c) having satisfactory values of SPEC, SENS, PPV and NPD values of RAPA 1 aerobic.

It has been found a significant relationship between the RAPA 1 aerobic and the IPAQ-SF in healthy individuals, which seems to be compatible with our results (16). In our study, there was a significant relationship between the RAPA 1 aerobic and the IPAQ-SF total score in older patients with COPD. Besides, it was shown that patients with a high grade of mMRC had a low level of physical activity. Additionally, it was also suggested that the mMRC

Table 3. Correlations between RAPA 1 aerobic and other outcomes

	RAPA 1 aerobic	
	r	p
6MWT	0.626	<0.001
mMRC	- 0.454	<0.001
IPAQ-SF total score	0.968	<0.001
IPAQ-SF sitting time	- 0.602	<0.001

p <0.05 considered statistically significant. **r:** Spearman's rank correlation coefficients value; **RAPA:** Rapid Assessment of Physical Activity; **IPAQ-SF:** International Physical Activity Questionnaire-Short Form; **6MWT:** 6 Minute Walk Test; **mMRC:** Modified Medical Research Council scale.

could be a useful tool for estimating the level of physical activity in daily life (26). Similarly, it was considered that a high score of mMRC could be an objective parameter for limited physical activity (27). A previous study reported that patients with increased mMRC scores had a very inactive lifestyle (28). These results seem to be consistent with our results. In our study, there was a significant relationship between the RAPA 1 aerobic and mMRC. On the other hand, it was accepted that 6MWT, which is an objective parameter for exercise capacity, as an independent predictor of physical activity in COPD (23, 29). Similarly, it was found a significant correlation for distance walked in the 6MWT with the total level of physical activity (r=0.37, p<0.05) (30). In our study, there was a significant relationship between the RAPA 1 aerobic and 6MWT. The inter-rater reliability between RAPA and IPAQ-SF was calculated by the Cohen's kappa coefficient (κ). There was almost perfect agreement between two questionnaires (κ = 0.915). The Community Health Activities Model Program for Seniors physical activity self-report questionnaire (CHAMPS) was used to assess the validity in the original validation study of the RAPA. According to results there was a significant correlation between the CHAMPS and RAPA (r = 0.54) (17). Our findings showed that the RAPA has significant correlations with other physical activity measures, thus, we demonstrated that the RAPA was valid for older patients with COPD.

It has been shown that the RAPA showed a good sensitivity (95.9%) (16). Similarly, we found a good sensitivity of the RAPA (87.5%) in older patients with COPD. Moreover, it was previously found that the specificity of the RAPA was 42.62% (16). In contrast, we found that RAPA showed good specificity (100%) in patients diagnosed with COPD. This difference between studies might be due to dyspnea, which leads to increased inactivity in patients with COPD.

We have some limitations. First, all the measures that used, apart from 6MWT, were self-reported. Even though our tools were considered valid and reliable, objective measures such as accelerometers could be used. Second, just like as the original validation study of the RAPA, we did not evaluate the test-retest. However, the Turkish version has already showed very high test-retest reliability (16, 17).

CONCLUSION

Consequently, our study showed the RAPA is more specific, easy to use, fast-measuring and valid questionnaire to measure physical activity in older patients with COPD.

Conflict of Interest: The authors declare no competing financial interests and no sources of funding and support, including any for equipment and medications.
Ethical approval: Ethical approval was obtained from the Institutional Ethics Board of Dokuz Eylül University. The study was performed in accordance with the ethical standards as laid down in the 1965 Declaration of Helsinki and its later amendments. Informed consent was obtained from all individual participants included in the study.
Peer-review: Externally peer-reviewed.

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