Outcomes between different validated questionnaires to assess the level of physical activity in cardiac patients adhering to a rehabilitation program

Desfechos entre diferentes questionários validados para a avaliação do nível de atividade física em cardiopatas adeptos a um programa de reabilitação

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Abstract

Introduction: The International Physical Activity Questionnaire (IPAQ) and Baecke inventory are commonly used in cardiovascular rehabilitation routines. Thus, it is understood that investigations on the equivalence of outcomes between these two tools may be relevant to measure the magnitude of possible reproducibility and correlations between them. **Objective:** To compare in cardiac patients the level of physical activity obtained through the IPAQ and Baecke inventory and correlate outcomes obtained with a 6-minute walk test. **Methods:** In total, 65 heart disease patients included in a cardiovascular rehabilitation program (40 male and 25 female) were included, with a mean age of 65.8 ± 10.5 years. The data were obtained from the application of a standardized form, containing the proposed study objects, which were the IPAQ and Baecke inventory. In addition, data regarding anthropometric measurements (body mass, height, and body mass index - BMI), waist-to-hip ratio, blood pressure, and performance in the 6-minute walk test were measured. **Results:** The main outcomes refer to the weak association between the instruments evaluated, which showed a strong relationship only between free time physical activity (r = 1), while in the other categories and when compared to the 6-minute walk test, the verified agreement was not significant. **Conclusion:** The questionnaires are strongly equivalent only for free time physical activity, in the other categories and when compared to the 6-minute walk test, the agreement was not significant. Thus, based on the results, implementation in clinical practice considering the use of these tools with equivalence is not recommended.

Keywords: Cardiac rehabilitation. Cardiorespiratory fitness. Physical exercise. Physiotherapy. Risk factors for heart disease.

Resumo

Introdução: O Questionário Internacional de Atividade Física (IPAQ) e o inventário de Baecke são comumente utilizados em rotinas de reabilitação cardiovascular. Assim, entende-se que investigações sobre a equiva-lência de desfechos entre essas duas ferramentas possam ser relevantes para mensurar a magnitude da possível reprodutibilidade e correlação entre tais métodos. **Objetivo:** *Comparar em cardiopatas o nível de atividade física obtido por meio do IPAQ e do Baecke e correlacionar desfechos obtidos com o teste de caminhada de 6 minutos (TC6).* **Métodos:** *Foram incluídos no estudo 65 cardiopatias inseridos em um programa de reabilitação cardiovascular, sendo 40 do sexo masculino e 25 do sexo feminino, com idade média correspondente a 65,8 ± 10,5 anos. Os dados foram obtidos a partir de um formulário padronizado, contendo os objetos de estudo propostos (IPAQ e Baecke). Além disso, dados referentes a medidas antropométricas (massa corporal, estatura e índice de massa corpórea), relação de cintura quadril, pressão arterial e TC6 foram avaliados.* **Resultados:** *Os principais desfechos se referem à fraca associação entre os instrumentos avaliados, que demonstraram relação forte somente entre atividade física de tempo livre (r = 1), sendo que nas demais categorias e quando comparadas ao TC6 a concordância verificada não apresentou significância estatística.* **Conclusão:** *Os questionários se equivalem fortemente somente quando diz respeito à atividade física de tempo livre. Desta forma, não faz sentido a implementação de prática clínica que considere a utilização das ferramentas IPAQ e Baecke com equivalência, o que verificou-se não existir.*

Palavras-chave: Reabilitação cardíaca. Aptidão cardiorrespira-tória. Exercício físico. Fisioterapia. Fatores de risco de doenças cardíacas.

Introduction

The practice of continuous and systematic physical activity (PA) has relevant importance in better quality of life, a reduction in the risk for diseases of chronic degenerative origin,[1-3] and prevention and rehabilitation of cardiovascular diseases.[3,4] Researchers have developed and used methods able to evaluate the level of PA in different population profiles, in the scope of investigation, both for the diagnosis of risk situations and for measuring the evolution in rehabilitation and training programs. It is important that these assessment tools are accessible in terms of low cost and ease of application,[5,6] such as the International Physical Activity Questionnaire (IPAQ)[7,8] and the Baecke inventory,[9] both of which are validated for the Brazilian population and widely implemented in research and clinical care settings.

Both these questionnaires enable the estimation of the weekly time spent in moderate and vigorous PA, in different daily contexts, such as work, transport, household chores and leisure, as well as the time spent in passive activities, such as those performed in the sitting position. The conclusion provides estimated values of the PA levels performed by the subject, considered as satisfactory (active) or unsatisfactory (sedentary).[10-14] Both the IPAQ and the Baecke inventory have been used in several studies to assess the level of PA in individuals with cardiovascular disorders and risk factors for these diseases.[15-17]

In this regard, it is evident that in patients with heart disease, the assessment of PA levels is important in order to establish strategies capable of stimulating changes in lifestyle, which can aid considerably in the reduction in the occurrence of risk factors and comorbidities resulting from cardiovascular diseases. However, despite the wide use of these questionnaires in different populations, after searching the pertinent literature, no studies were found that analyzed the possible equivalence of these instruments for this evaluation.

It is hypothesized that, given the similarities verified between these tools, that there may be equivalence between them, especially with regard to the highest levels of PA, and that in this way either of them can be used in clinical practice with safety and precision to understand the levels of PA. Furthermore, it is believed that the questionnaires could be positively related to the 6-minute walk test (6MWT), since this test provides a global analysis of the cardiac and respiratory systems, reflecting exercise tolerance, so that if an individual is classified as active or very active by the questionnaires, it is also expected that this individual will present greater functional capacity verified by the 6MWT.

Given the above, it is understood that a study of this nature, aiming to demonstrate whether there is equivalence of outcomes between these two tools in patients with heart disease undergoing a rehabilitation program, may be relevant to measure the magnitude of the possible reproducibility and correlation between these methods. In addition, in clinical practice, questionnaires could be easier to apply than the 6MWT, as they can be applied during the rehabilitation session or

self-administered, even in the patient's home, optimizing time and providing important periodic data on PA levels. The aim of this study, therefore, was to compare the classification of the PA level obtained through the IPAQ in patients with heart disease included in a cardiovascular rehabilitation program with that provided by the Baecke inventory and to correlate both outcomes with values obtained in the 6MWT.

Methods

Sample characterization

In total, 65 participants were included, with a diagnosis of heart disease or risk factors, included in a cardiovascular rehabilitation program, 40 male and 25 female, with a mean age of 65.8 ± 10.5 years. The following clinical conditions were considered: arterial hypertension, dyslipidemia, acute myocardial infarction, dilated cardiomyopathy, coronary insufficiency, grade I atrioventricular block, and arrhythmia. All included participants regularly participated in a rehabilitation program, with an appropriate medical referral. Participants who did not complete all stages of the study were excluded.

Ethical aspects

Participants were informed about all the procedures and objectives of the study and were invited to sign an informed consent form (ICF), assuring their rights and privacy. In addition, the study was approved by the ethics committee in research involving human beings of the Faculty of Sciences and Technology, Universidade Estadual Paulista (UNESP, opinion no.: 387,981).

Study design

This is an observational, cross-sectional study. The information was collected in November 2019, in a cardiovascular physiotherapy sector of the teaching clinic of UNESP. Prior to visiting the clinic, the participants were instructed to eat a light meal 2 hours before the collections and to wear comfortable clothes and shoes.

Data were obtained from the application of a standardized form, containing the proposed study objects, which were the IPAQ and Baecke. In addition, anthropometric measurements (body mass, height, and body mass index - BMI), waist-hip ratio, blood pressure, and application of the 6MWT were individually measured. Measurements were performed by previously trained researchers, with experience in the methods developed, in order to ensure standardization of procedures and less risk of bias. In addition, each parameter described was measured by the same evaluator.[18] Data collection took place at the same time of day (morning) for all participants, to avoid influences from the circadian cycle.

Procedures

Anthropometric characteristics

Body mass was measured using a digital scale (Welmy R/I 200 - Brazil), with participants in an orthostatic position, arms extended along the body, and height using a stadiometer (Sanny, Brazil), while barefoot. BMI was calculated from body mass and height data, using the following formula: body mass (kg)/height² (m²).[19,20]

Blood pressure

Blood pressure was measured indirectly using a stethoscope and aneroid sphygmomanometer on the left arm, according to the criteria established by the VI Brazilian Consensus on Arterial Hypertension.[20,21]

6MWT

The 6MWT was applied according to all the recom-mendations suggested in the study of Agarwala et al.[22] Thus, the test lasted a total of 6 minutes, in which the participant walked alone in a corridor of the clinic, with a total distance of 30 meters, at the maximum speed they were able to, as long as the pace was comfortable.

IPAQ

The IPAQ is a previously validated tool, including in Brazil, for different populations that include, for example, older adults and adults,[8,23,24] which considers the previous seven days of physical activity. It is widely used in clinical and research areas due to its low cost and fast application.

The questionnaire consists of categories that include information on work activities, transportation, domestic activities, and leisure.[11] The score is given by the sum for each sub-item of the answers that encompass aspects of frequency (days) and duration (hours and minutes) of the activities performed by the individual,[24] such that the final score classifies the participant as very active, active, irregularly active, or sedentary.

Baecke Inventory

The Baecke inventory considers the previous 12 months, consisting of 16 questions distributed in three distinct sections: 1) occupational physical activities (OPA); 2) leisure-time physical activity (LTPA); and 3) locomotion physical activities (LPA).[25] The OPA is evaluated through questions 1 to 8, in which question 1 takes into account the type of occupation, classified into three levels of energy expenditure: light, moderate, and vigorous, and questions 2 to 8 refer to activities during work.[5,25] The investigation of LTPA is carried out through the practice of regular physical exercises (question 9) involving specific modalities, divided into three levels of intensity (light, moderate, and vigorous) according to energy expenditure. The duration and frequency (hours per week and months per year) of each activity are investigated. Based on intensity, frequency, and duration, a specific score is calculated for this question. The score includes three more questions (10 to 12), which compare leisure time PA with people of the same age, the presence of sweat, and the practice of physical exercises without regularity.[25]

For the LPA assessment, the questions refer to the activities of watching television (sedentary activity), walking, cycling, and a final question about the minutes per day in locomotion activities (walking or using a bicycle to go to and from work, school, or shopping).[25]

Statistical analysis

All analyses were performed using SPSS statistical software version 13.0 (Statistical Package for the Social Sciences Inc, Chicago, Illinois). Data referring to anthropometric characteristics are presented as mean and standard deviation values. To compare the levels of PA with the values obtained in the 6MWT, Pearson's or Spearman's correlation was used, depending on the normality of the data (Shapiro Wilks test). The Kappa index was used to establish the agreement between the questionnaires and the 6MWT. Significance values (p-value) lower than 5% were considered statistically significant. Pearson's test was used to perform the agreement between the questionnaires and the 6MWT.

Results

The 6MWT showed that the mean distance covered for men was 518.3 ± 72.6 m, while for women it was 471.4 ± 58.3 m. Considering the total values of both sexes, the distance covered corresponded to 500 ± 70.8 m.

Table 1 presents the anthropometric characteristics of the participants, also stratified by sex. When considering all participants, it was found that mean and standard deviation values were 65.8 ± 10.5 years for age, 78.6 ± 14.4 kg for body mass, 1.6 ± 0.1 m for height, 0.9 ± 0.1 cm for the waist-hip ratio, and 29.0 ± 4.5 kg/m² for BMI.

Table 1 - Characteristics of the participants (mean and standard deviation)

	Men (n = 40)	Women (n = 25)	Total (n = 65)
Age (years)	66.27 ± 10.40	65.19 ± 10.68	65.80 ± 10.50
BM (kg)	81.09 ± 14.76	74.70 ± 13.30	78.60 ± 14.40
Height (m)	1.69 ± 0.08	1.57 ± 0.06	1.60 ± 0.10
WHR (cm)	0.97 ± 0.07	0.87 ± 0.08	0.90 ± 0.10
BMI (kg/m²)	28.30 ± 4.30	30.10 ± 4.07	29.00 ± 4.50

Note: BM = body mass; BMI = body mass index; WHR = waist-hip ratio.

Table 2 shows the percentage values related to the PA level according to the IPAQ, stratified into: active (those who reported PA >150 minutes per week) and sedentary (participants who reported PA < 150 minutes per week). It was found that when considering total PA, 63% of the participants were active; activities corresponding to work and household chores were performed by 60% of the participants, only 20% performed PA for locomotion, and 100% reported performing PA for leisure. These data suggest that the investigated public proved to be fully involved in social activities (leisure), that they had little need to walk and that, for the most part, they still actively carried out activities corresponding to work and home.

Table 2 - Classification of physical activity level according to the International Physical Activity Questionnaire (IPAQ)

	Active n (%)	**Sedentary** n (%)
Total PA	41 (63)	24 (37)
Work/home PA	39 (60)	26 (40)
LPA	13 (20)	52 (80)
LTPA	65 (100)	0 (0)

Note: PA = physical activity; LPA = locomotion PA; LTPA = leisure time PA. Active = > 150 min in the respective PA.

Table 3 shows the mean and standard deviation values related to the classification level for PA according to the Baecke inventory. The results showed that women were more active for all variables investigated (total PA, PA at work/home, LPA, and LTPA).

Table 3 - Classification of level and physical activity according to the Baecke Inventory

	Men (n = 40)	**Women** (n = 25)	**Total** (n = 65)
OPA	0.52 ± 0.94	2.55 ± 1.23	1.23 ± 1.43
Leisure time PA	2.34 ± 0.50	2.35 ± 0.46	2.34 ± 0.48
LPA	1.86 ± 0.70	2.06 ± 0.53	1.94 ± 0.65
Total PA	4.72 ± 1.15	6.87 ± 1.75	5.51 ± 1.74

Note: OPA = occupational physical activity (PA); LPA = locomotion PA. Data expressed as mean and standard deviation values.

Table 4 shows the correlation values between the numerical values of the Baecke and IPAQ questionnaires with the 6MWT. For the IPAQ, after their classification, the results of the participants were dichotomized into: 1 = sedentary; 2 = irregularly active; 3 = active; and 4 = very active. Thus, the values ranged from 0 to 1, with 1 being equivalent to the most active possible and 0 to being sedentary. In this regard, in men, the data analysis showed a high correlation between the IPAQ and 6MWT ($p = 0.9236$) and between the Baecke inventory and 6MWT ($p = 0.9991$). Considering the total number of participants, there was a high correlation between the IPAQ and 6MWT ($p = 0.8369$). The other correlations demonstrated were low or moderate (Table 4).

Table 4 - Correlation between the numerical values of the Baecke Inventory, the International Physical Activity Questionnaire (IPAQ), and the 6-minute walk test (6MWT)

	Mulheres (n = 25)	**Homens** (n = 40)	**Total** (n = 65)
Baecke x IPAQ	r = 0.4166	r = 0.1853	r = 0.4250
	p = 0.0383	p = 0.2523	p =0.0004
IPAQ x 6MWT	r = 0.2213	r = 0.0157	r = -0.0260
	p = 0.2878	p = 0.9236	p = 0.8369
Baecke x 6MWT	r = 0.0587	r = -0.0002	r = -0.1487
	p = 0.7804	p = 0.9991	p = 0.2373

Finally, Table 5 presents the analysis of agreement according to Kappa between the study variables, characterized by the IPAQ, Baecke inventory, and 6MWT. There was absolute agreement for LTPA IPAQ x LTPA Baecke, considering stratification by sex and total.

Table 5 - KAPPA agreement between the International Physical Activity Questionnaire (IPAQ), the Baecke Inventory, and the 6-minute walk test (6MWT)

	Women (n = 25)	**Men** (n = 40)	**Total** (n = 65)
Baecke total x IPAQ total	0.065	0.020	0.079
OPA IPAQ x OPA Baecke	0.055	0.022	0.062
LTPA IPAQ x LTPA Baecke	1.000	1.000	1.000
LPA IPAQ x LPA Baecke	-0.066	0.386	0.238
IPAQ X 6MWT	0.310	-0.027	0.024
Baecke x 6MWT	0.012	0.015	-0.035

Note: OPA = occupational physical activity (PA); LTPA = leisure-time PA; PA = locomotion PA.

Discussion

The objective of this study was to compare the classification of the level of PA obtained through the IPAQ with the Baecke inventory and to correlate both outcomes with the values obtained in the 6MWT in patients with heart disease, inserted in a cardiovascular rehabilitation program. The main outcomes refer to the absolute agreement between the questionnaires for LTPA, however, without significant agreement for the other domains.

In relation to LPA, insufficient values were found (< 150 minutes per week) among the evaluated participants, corresponding to 80% sedentary in this domain. Similarly, the study by Madeira et al.[26] evaluated older adults and concluded that 73% of the participants were also insufficient for locomotion PA. These data can be justified by some hypotheses. Firstly, a large portion of the participants in this study had a private or family vehicle that they used when necessary, which reduced the chances of active displacement. Secondly, because they are patients with heart disease who have often had a cardiovascular event, they may feel insecure in walking alone, even for short distances. Thirdly, the participants lived in a large municipality, which implies a logistical difficulty for walking, since the places visited are often far from each other.

With regard to the 6MWT, the mean distance verified in the present study was 500 meters. The study of Araya-Ramirez et al.,[27] who also evaluated patients with heart disease, found a similar mean value, corresponding to 472 meters. In this regard, evidence shows good levels of functionality acquired by patients with heart disease included in clinical rehabilitation programs, in addition to several other benefits, such as better levels of general health, cholesterol reduction, blood pressure reduction, weight loss, social interaction, and greater personal satisfaction and quality of life, which contribute to a lower incidence of cardiovascular events and, consequently, greater longevity.[27]

The study of Spana et al.[28] implemented PA analyses using the Baecke instrument in ischemic heart disease patients enrolled in a rehabilitation program, and demonstrated mean values corresponding to 7.0 ± 1.1 for total PA. In agreement, in the present study, the values found were 5.51 ± 1.74. Data were similar in all subdomains of the leisure-time, leisure, and locomotion inventory. In conclusion, cardiovascular rehabilitation associated with the socioeconomic level and age group of patients included in this routine seems to explain the values verified in each item analyzed.[28]

There was a significant relationship between the IPAQ and Baecke values in women (p = 0.0383) and in both sexes (p = 0.0004) when performed with numerical values from the questionnaires. However, this correlation was not verified when the values were dichotomized into 0 and 1. It is believed that an explanation for this incongruity is based on the fact that when classified as 0 and 1, the values reflect an extremist condition, since

only averages of populations similar to those of the present study were used. In addition, the correlation found in females seems logical in older women, as they apparently perform more household chores daily when compared to men.[29] However, this cannot be stated with certainty as these data were not investigated in the present study.

Regarding the absolute agreement of the LTPA domain between the questionnaires through the KAPPA, this is justified by the fact that all the patients included regularly performed a cardiovascular rehabilitation program, with a frequency of three times a week and duration of 60 minutes per session, and did not perform other exercises. Finally, as shown, the isolated outcomes of the analyzed tools are similar to the outcomes described in the literature; however, the same outcomes do not demonstrate proportional correspondence when compared to each other. Thus, the data suggest the need for caution regarding the implementation of these tools in clinical practice, avoiding comparisons of outcomes from both tools.

A limitation observed in the present study refers to the fact that a control group, composed of sedentary patients with heart disease, was not included. It is believed that this comparison would allow robust analogies regarding the magnitude of the effect of cardiovascular rehabilitation on the investigated PA levels, as well as the responses from the investigated methods. Thus, it is suggested that future studies fill this gap.

Conclusion

The data presented allow us to conclude that the IPAQ and Baecke questionnaires, when applied to participants in cardiovascular rehabilitation programs, are strongly equivalent only in relation to free-time physical activity; in the other categories, and when compared to 6MWT, they did not show significant agreement. Thus, based on the results, implementation in clinical practice considering the use of these tools with equivalence is not recommended.

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Authors' contribution

RLG designed the study, conducted the analyses, and wrote the manuscript. RLM, JSSL, and CBJA assisted in the acquisition, analysis, and interpretation of data and revised and edited the article. LCMV and RMRL made substantial contributions, including conception and design of the study, and a critical review of the article. All authors read and approved the final manuscript.

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