

# Methodology to evaluation the habitual physical activity in men aged 50 years or more

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## Keywords

Exercise. Evaluation. Methods. Questionnaires. Aging health. Bone density. Habitual physical activity.

## Abstract

### Objective

To describe the methodology for evaluating habitual physical activity that was adopted for a survey among the male population utilizing a questionnaire validated earlier.

### Methods

The Baecke questionnaire on habitual physical activity was translated into Portuguese and then back-translated into English by two anglophone teachers. The final version of the questionnaire was applied in a cross-sectional epidemiological study done on 326 men aged 50 years or over. The internal consistency among the questions was evaluated using the Cronbach a statistic. The Spearman correlation coefficients between the habitual physical activity scores were calculated. Partial correlation coefficients with adjustments for age, body mass index and schooling were also calculated.

### Results

There was satisfactory internal consistency in relation to the magnitudes of occupational physical activity and leisure-time physical exercises. Significant correlation was obtained between all the physical activity scores and the total habitual physical activity score, independent of age, body mass index and schooling.

### Conclusions

The Baecke questionnaire was found to be a practical instrument for assessing habitual physical activity that is quickly applied and easily understood, and it is recommended for epidemiological studies in Brazil.

## INTRODUCTION

The search for methods for assessing physical activity in a population-based context that would be accessible from the points of view of cost and ease of application has stimulated researchers to develop questionnaires for evaluating habitual physical activity (HPA). Caution is required in choosing the HPA questionnaire, because such questionnaires need to cover all the peculiarities of HPA, which may vary

according to the environment, culture and sociodemographic characteristics of populations.

There are now more than twenty HPA instruments listed in the literature, and some of these are specific for adolescents, adult men and women, or elderly people.<sup>20</sup> The Baecke et al<sup>2</sup> HPA questionnaire originated in Holland and was published in 1982. It gives three scores for physical activity over the last twelve months, which is characterized as occupational ac-

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tivities, physical exercise and leisure-time and locomotive activities. This instrument has been utilized in epidemiological research worldwide,<sup>3,4,10,15,20</sup> and in Brazil it has been utilized with HPA score analyzed as a continuous quantitative variable<sup>6-8</sup> and as a category variable.<sup>26</sup>

It is structured in a qualitative-quantitative form on the Likert scale, taking into account people's points of view regarding their physical activities. Furthermore, it is easy to understand and fill out.

The objective of the present study was to describe the translation into Portuguese and the internal consistency of the Baecke et al<sup>2</sup> HPA questionnaire, and to describe the methodology for evaluating HPA that was adopted for a research project that studied the factors related to bone mineral density among men aged 50 years or over.

## METHODS

### Translation phase for the habitual physical activity questionnaire

The authors of the Baecke et al<sup>2</sup> HPA questionnaire gave their permission for a translation of the instrument. Once this permission had been obtained, the translation phase was accomplished in three stages, following some recommendations adapted from other studies.<sup>5,12,26</sup>

First, the original Baecke et al<sup>2</sup> questionnaire was translated from English into Portuguese by two experienced researchers. A consensus on this translation was reached after discussion with the researchers responsible for the project. Next, back translation was performed by two English teachers born in the United States and England. Once again, the researchers responsible for the project compared the translations and discussed the discrepancies found. These discrepancies were related to the adaptations of the wording in questions 1, 6, 8 and 9 of the questionnaire. Finally, the group again contacted the authors of the original questionnaire, to present the final results from the translation and the application of the instrument.\*

### Validation and reproducibility

The validation and reproducibility of the questionnaire were assessed among male students in the sixth semester of the physical education course of the Military Police School of the State of São Paulo.<sup>9</sup> The scores for leisure-time physical exercises, leisure-time

activities and locomotion and the total score were considered valid for measuring the frequency and intensity of the practice of physical exercise, since this correlated significantly with the physical exercise index, the percentage decrease in heart rate and the locomotive activities index. The interviews were compared with a difference of 45 days, and it was seen that the average scores were similar and the intraclass correlation coefficients were greater than 0.69, thus demonstrating good reproducibility.

### Habitual physical activity evaluation questionnaire

The Baecke et al<sup>2</sup> questionnaire investigates the HPA of the last twelve months. This instrument is made up of 16 questions and covers three components of physical activity: 1) OPA - occupational physical activities (Q<sub>1</sub> to Q<sub>8</sub>); 2) LPE - leisure-time physical exercises (Q<sub>9</sub> to Q<sub>12</sub>); and 3) LPA - leisure-time and locomotive physical activities excluding physical exercise (Q<sub>13</sub> to Q<sub>16</sub>).

OPA is evaluated through questions 1 to 8. Question 1 considers the type of occupation, which is classified into three levels of energy expenditure: light, moderate or vigorous. For this classification, the Ainsworth<sup>1</sup> physical activity compendium is recommended, since the professions cited in the original article describing the questionnaire are not very comprehensive. Moreover, the energy expenditure attributed to some of these professions is now out-of-date. The other questions (2 to 8) relate to activities during work and are very objective, inquiring whether the individual remains seated, remains standing, walks around, carries heavy loads or feels tired after work, and a comparison is made with how physical the work done by other persons of the same age is. For retired people or those discharged from duties, a second occupational activity needs to be considered.<sup>22</sup> If there is no second activity, adoption of a score of 1.000 is recommended.<sup>20</sup> For domestic activities, adoption of the moderate level in question 1 is recommended.<sup>23</sup>

LPE is evaluated in relation to the practice of regular physical exercise of specific types (question 9), which is divided into three intensity levels according to the energy expenditure: light, moderate or vigorous. For this classification, the physical activity compendium cited earlier<sup>1</sup> is suggested. The duration and frequency (hours per week and months per year) for each activity are solicited. The specific score for question 9 is then calculated from the intensity, frequency and duration. This score brings together

\*The final version of the questionnaire in Portuguese is available to interested researchers.

another three questions (10 to 12), relating to comparison of leisure-time physical activities with those of other people of the same age, sweating during leisure time and the irregular practice of physical activities during leisure time.

LPA is evaluated in relation to the activities of watching television (sedentary activity), walking, cycling and, finally, the number of minutes spent per day on locomotive activities (walking or using a bicycle to go to and come back from work, school or shops)

The total score for HPA is the sum of the scores for OPA, LPE and LPA. For questions not answered on the grids, it is recommended that the average value from all the questions of the respective score is adopted.<sup>21</sup> The formulae for calculating the scores can be found in Baecke et al<sup>2</sup> (1982).

#### **Methodology for the evaluation of habitual physical activity**

This was a cross-sectional epidemiological study. The data collection was performed between March and October 1997, at the outpatient clinic of Hospital Heliópolis, in São Paulo. This is a state-funded public hospital founded in 1969 that provides healthcare in various specialties. It attends to patients coming from the southern region of the city of São Paulo and the cities of Santo André, São Bernardo, São Caetano and Diadema.

The sample was made up of 326 healthy male volunteers aged 50 years or over who were not using medications that could have affected bone metabolism and who did not have diseases like cancer, myeloma, hyperthyroidism or rheumatoid disease. Invitations to participate in the study were issued through announcements in the local newspaper and posters, to men who lived close to the outpatient clinic of Hospital Heliópolis, whether or not they were attending the clinic, and also to the husbands of women who were referred for bone densitometry examination and male employees of the Heliópolis hospital complex.

The Ethics Committee of Hospital Heliópolis and the Research Ethics Committee of the School of Public Health of the University of São Paulo approved the research. Details of the methodology utilized are described in previous work.<sup>6-8,13,25,28</sup> The HPA evaluation was done using the questionnaire developed by Baecke et al<sup>2</sup> (1982).

This questionnaire was originally self-administered.<sup>2,19</sup> However, in the present research, the people were interviewed because of the low level of school-

ing among the study population. Such a procedure has already been utilized in other research.<sup>10,20</sup> The time required for the interviews ranged from five to ten minutes.

#### **Statistical analysis**

The characterization of the study population was done using descriptive statistics. The internal consistency of the instrument was analyzed using the Cronbach  $\alpha$  coefficient. The Spearman correlation coefficients were calculated between the scores for OPA, LPE, LPA and total HPA, since the HPA scores did not have goodness of fit to normal distribution, as evaluated via the Kolmogorov-Smirnov test. Partial correlation coefficients between the scores were calculated, with adjustments for age, body mass index (BMI) and schooling (in years). The analyses were done using the SPSS software (version 10.0), and a significance level of 5% was adopted for all analyses.

#### **RESULTS**

Evaluations were made on 326 men with a mean age of 62.5 years (standard deviation, SD, of 7.9 years), with predominance of individuals in the age ranges of 50 to 59 years (42%) and 60 to 69 years (37.4%). The majority of the men was married (86.8%), had white skin color (80.1%) and had not completed their basic education up to eighth grade (73.6%). The mean BMI was 26.7 kg/m<sup>2</sup> (SD = 4.1 kg/m<sup>2</sup>) and a large proportion of the men were overweight (42%) or were considered to be obese (22%).

It was seen that only 28.2% of the participants said they had moderate or vigorous energy expenditure in their jobs, and only 6.4% reported that they had practiced physical exercises over the last twelve months. However, 67.8% of the interviewees said they walked or cycled to get around, for a period of 30 minutes or more per day. Half of the population (53.5%) said they watched television very often during their leisure time.

The internal frequency of the instrument is described in Table 1. The largest Cronbach  $\alpha$  coefficients were between the questions for the LPE score ( $\alpha=0.45$  or more). However, it was seen that, if the question evaluating "sweating while practicing leisure-time physical exercises" was removed, the internal consistency improved. In the questions for the OPA score, the coefficients were low, especially in the questions about remaining standing or walking around while working. On the other hand, the questions about sitting at work and comparing the work with what other people were doing presented good

**Table 1** - Cronbach  $\alpha$  coefficients between the score questions and between the HPA scores of the Baecke et al<sup>2</sup> questionnaire.

Item	Question	Cronbach $\alpha^*$	Cronbach $\alpha^{**}$
<b>Occupational physical activities (OPA)</b>			
Type of occupation	1	0.32	0.26
Sitting at work	2	0.60	0.66
Remaining standing at work	3	0.15	0.35
Walking around at work	4	0.15	0.40
Carrying heavy weight at work	5	0.39	0.20
Feeling tired after work	6	0.38	0.35
Sweating at work	7	0.33	0.05
Comparing the work physically with other people's work	8	0.52	0.22
<b>OPA score</b>		<b>0.52</b>	<b>0.76</b>
<b>Physical exercise during leisure time (LPE)</b>			
Type of physical exercises	9	0.85	0.75
Comparing the leisure-time physical activity with other people's activities	10	0.66	0.60
Sweating during leisure time	11	0.45	0.81
Practicing physical exercises during leisure time	12	0.65	0.62
<b>LPE score</b>		<b>0.52</b>	<b>0.77</b>
<b>Physical activities during leisure time and locomotion (LPA)</b>			
Watching television during leisure time	13	0.18	0.69
Walking during leisure time	14	0.47	0.17
Cycling during leisure time	15	0.13	0.39
Minutes per day spent on locomotive activities	16	0.50	0.16
<b>LPA score</b>		<b>0.62</b>	<b>0.71</b>

\* $\alpha$  obtained with the inclusion of the item\*\* $\alpha$  obtained with the exclusion of the item

coefficients (respectively,  $\alpha=0.60$  and  $0.52$ ). Finally, there was great variability among the coefficients in the questions for the LPA score ( $\alpha$  from  $0.13$  to  $0.50$ ), while it was noted that the internal consistency improved if the question about "watching television during leisure time" was removed from the score.

Table 2 presents the correlation matrix for the HPA scores. The strongest correlations were obtained between the total HPA score and the LPA score ( $r=0.78$ ), followed by the OPA score ( $r=0.70$ ) and then the LPE score ( $r=0.60$ ), even after adjustment for age, BMI and level of schooling (respectively,  $r_{adj}=0.77$ ,  $r_{adj}=0.67$  and  $r_{adj}=0.67$ ). Among the scores, the correlations were always positive and weak ( $r<0.31$ ), although significant. The adjustments for age, BMI and level of schooling altered the values of the correlation coefficients very little.

## DISCUSSION

The utilization of the Baecke et al<sup>2</sup> questionnaire for evaluating HPA was shown to be adequate for a

study of the determinant factors for bone mass among men aged 50 years or over. It should be remembered that this questionnaire has already been applied to men in another age group<sup>9</sup> and women,<sup>\*</sup> without problems occurring.

According to the Brazilian demographic census of 2000, out of the total number of men aged 50 years or over, 54% were in the age range of 50 to 59 years, 77.4% had studied up to seventh grade and 62% said they had white skin color. In the present study, although the population consisted of volunteers, it presented characteristics similar to the whole Brazilian male population (in the study, 42% were in the age range of 50 to 59 years, 73.6% had studied up to seventh grade and 80% said they had white skin color). This contributed towards the external validity of the study.

According to the living standards survey made by the Brazilian Institute for Geography and Statistics (IBGE) between 1996 and 1997,\*\* the prevalence of overweight among Brazilian men aged over 45 years was 30.4% and obesity 6.8% (average BMI of 24.4

**Table 2** - Spearman correlation coefficients ( $r$ ) and partial correlation coefficients adjusted for age, body mass index (BMI) and level of schooling ( $r_{adj}$ ), between the Baecke et al<sup>2</sup> HPA questionnaire scores.

Scores	LPE		LPA		Total HPA (ET)	
	$r$ (p)	$r_{adj}$ (p)	$r$ (p)	$r_{adj}$ (p)	$r$ (p)	$r_{adj}$ (p)
OPA	0.25 (<0.001)	0.18 (0.005)	0.31 (<0.001)	0.29 (<0.001)	0.70 (<0.001)	0.67 (<0.001)
LPE	1.0	1.0	0.21 (<0.001)	0.27 (<0.001)	0.60 (<0.001)	0.67 (<0.001)
LPA			1.0	1.0	0.78 (<0.001)	0.77 (<0.001)

HPA: Habitual physical activity

\*Florindo AA, Latorre MRDO, Santos ECM, Negrão CE, Azevedo LF, Segurado AAC. Validation and reliability of the Baecke's questionnaire for the evaluation of habitual physical activity in HIV/AIDS subjects. *Pan Am J Public Health* [Submitted for publication].

\*\*Instituto Brasileiro de Geografia e Estatística. Pesquisa de Padrão de Vida. 1996/1997 [CD-ROM]. [14 set 1998].

kg/m<sup>2</sup>). These values were higher than those in the present study.

Questionnaires are an important method for evaluating HPA, considering their low cost and ease of application.<sup>17</sup> The Baecke et al<sup>2</sup> questionnaire is one of the few described in the literature that is structured in a qualitative-quantitative manner on the Likert scale. This allows the individual to be positioned in relation to daily life in the environment where he lives, thereby offering better assessment of HPA.<sup>11</sup> Doubts have arisen regarding the efficacy of utilizing HPA questionnaires among populations that differ from those in which the questionnaire was originally validated.<sup>5,11,26</sup> In the case of the Baecke et al<sup>2</sup> instrument, these problems did not occur, given the objectivity of the questions.

This instrument was developed in Holland,<sup>2</sup> and has been utilized in epidemiological studies in countries like Belgium,<sup>3</sup> the United States<sup>4,10,20</sup> and Croatia.<sup>15</sup> In Brazil, this instrument was first used in the research project "Determinants of Bone Mineral Density in Men", from which the results were published in Brazilian<sup>7</sup> and international journals.<sup>8,25</sup>

With regard specifically to the components of physical activities that the scoring deals with, it can be seen that the occupational physical activity score is extremely important for health assessments. From the time of the study made among London Transport workers in 1953,<sup>16</sup> which showed a significant inverse relationship between the levels of occupational physical activity and cardiovascular diseases, evaluations of physical activity during work have been included in epidemiological studies.<sup>17</sup> However, this type of physical activity is difficult to evaluate because of the lack of an adequate instrument for such investigation.<sup>12</sup> One alternative utilized has been to take the type of occupation and base the assessment on the energy expenditure. Nevertheless, this may result in errors, since the specific activities within the work are not analyzed.<sup>12</sup>

The Baecke et al<sup>2</sup> occupational activity score, in addition to including the type of occupation on the basis of the energy expenditure (first question), evaluates other basic physical activities such as sitting, standing and walking around at work, carrying heavy loads at work, feeling tired after work and sweating at work, and also makes a comparison between the physical activity at work and physical activities performed by other people in the same age group. Because of this wide coverage, this score has been considered to be one of the most appropriate for evaluating manual physical work.<sup>12</sup>

In the present study, comprehension difficulties

were restricted to the eighth question, in which some people were unable to understand whether the expression "physically heavy" referred to stress or energy expenditure. Pols et al<sup>22</sup> (1995), studying Dutch men and women, also reported the same difficulty. In the present study, in analyzing the internal consistency, there was an improvement in the coefficient when question 2 was excluded. However, it was decided to keep question 2 in the score, considering that the question of physical inactivity relates to many professions. Furthermore, this question had a strong negative correlation with the OPA score ( $r=-0.72$ ;  $p<0.001$ ) (data not presented).

The evaluation of physical exercises performed during leisure time is one of the most important evaluations in the field of public health, given that the practice of regular physical exercise is a protective factor against various chronic non-transmittable diseases and the risk factors for these diseases, such as obesity and hyperlipidemia.<sup>18</sup> The Baecke et al<sup>2</sup> physical exercise score seeks to fully investigate the types of exercise practiced during leisure time. Question 9 (the first relating to the physical exercise score) evaluates regular practice through a trio that is important in the physiology of exercise: intensity, frequency and duration. The intensity is evaluated through the type of exercise, the duration via the number of hours practiced per week and the frequency via the number of months practiced per year. As a complement for this score, the interviewees are asked for their points of view regarding physical exercises during leisure time. There were some difficulties with the responses to questions 10 and 12. As emphasized in other studies,<sup>22,23</sup> because these are comparative and self-analytical questions, they may therefore generate some difficulty in responses. In the analysis of the internal consistency, there was an improvement in the coefficient when question 11 was excluded. However, it was decided to keep question 11 in the score, considering the importance of questions focusing on reported sweating or transpiration in the assessment of HPA.<sup>24,27</sup> Furthermore, this question had a strong positive correlation with the LPE score ( $r=0.80$ ;  $p<0.001$ ) (data not presented).

The score relating to the leisure-time activities and locomotion is relevant in the present context of epidemiology, in view of the benefits from daily practice of physical activities lasting 30 minutes or more.<sup>18</sup> The term 'locomotion' was included in this score, which is not cited in the literature, or in the original article, considering that question 16 primarily evaluates transportation activities on foot and by bicycle in daily activities like work, school and/or shopping. With regard to the responses for this score, it was only in this

last question that there were some problems, principally in recording exactly how many minutes per day were spent on these activities. In the analysis of the internal consistency, there was an improvement in the coefficient when question 13 was excluded. However, it was decided to keep question 13 in the score, considering the importance of evaluating the lack of physical exercises in the context of leisure-time activities, as well as the strong negative correlation with the LPA score ( $r=-0.88$ ;  $p<0.001$ ) (data not presented).

The total HPA score is also an indicator that may be useful when the aim is to evaluate all aspects of physical activities together, and it can be highlighted that two studies in international journals have recommended its utilization.<sup>3,23</sup>

The World Health Organization has proposed an international physical activity questionnaire (IPAQ). The long and short forms of this have already been validated on a sample of Brazilian volunteers aged over 12 years, living in the Greater São Paulo region and with a level of schooling a little above the average for Brazil.<sup>14</sup> Considering total physical activity, both forms have shown good reproducibility after 3 to 10 days, although their validity was considered to

be low to moderate, in comparison with the *Computer Science & Applications* (CSA) movement sensor. According to these authors, the main limitations found were difficulties in understanding the questions, for example, what a usual or normal week means, or what moderate or vigorous physical activity consists of. These authors also mentioned that there was difficulty in quantifying some activities, such as sitting, and individuals tended to skip some questions or give contradictory responses. The time taken to apply the long form was 8 to 20 minutes and the short form, 3 to 5 minutes.

The time taken to apply the Baecke et al<sup>2</sup> questionnaire was 5 to 10 minutes when utilized among a population of men aged 50 years or over with a low level of schooling, and there was practically no difficulty in quantifying their activities. Even when such difficulties have occurred, these studies have indicated solutions and thus, international standardization has been ensured.<sup>20-23</sup> Moreover, in the three studies in which this questionnaire has been utilized, the participants could be placed within the Likert scale for almost all the questions, and thus there was no need to make an interpretation, for example, of what vigorous or moderate signifies.<sup>8,9,\*</sup>

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