DOI: 10.4025/jphyseduc.v28i1.2833

Original Article

LEVEL OF PHYSICAL ACTIVITY IN BASIC EDUCATION TEACHERS EVALUATED BY TWO INSTRUMENTS

NÍVEL DE ATIVIDADE FÍSICA EM PROFESSORES DO ENSINO BÁSICO AVALIADO POR DOIS INSTRUMENTOS

Rômulo José Mota Júnior[1], Débora Dornelas Ferreira Tavares[2], Áurea Kelly Viana Gomes[1], Renata Aparecida Rodrigues de Oliveira[1] and **João Carlos Bouzas Marins[2].**

[1]Faculdade Governador Ozanam Coelho, Ubá-MG, Brasil.
[2]Universidade Federal de Viçosa, Viçosa-MG, Brasil.

ABSTRACT
Cardiovascular diseases are the main causes of national death, and sedentary is an important risk factor in this degenerative process. To evaluate the level of physical activity (LPA) of teachers in the public school system of Viçosa MG by means of two distinct instruments and the agreement obtained between them. A total of 200 teachers of both genders, aged between 25 and 68, participated in this research. LPA was measured by the International Physical Activity Questionnaire (IPAQ) and through the use of a pedometer. The calculations of the prevalence of active and non-physically active individuals were performed, and the Kappa (K) index was subsequently used to establish agreement between the instruments. All analyzes were performed in MedCalc software, version 14. 10. 2 and SPSS, version 20. For the IPAQ, 70% of teachers reached adequate levels of physical activity (LPA), while by the pedometer only 26.5%. The agreement between the five categories of the pedometer and the IPAQ was not significant, as well as in the classification in active and non-active, between the instruments. In conclusion **e**valuating the LPA through the IPAQ it was possible to perceive that the majority of the teachers were classified as active. However, when considering the threshold of 10000 steps/day of average, using the pedometer as an instrument of evaluation of the NAF, the majority of the group cannot be considered active. In addition, there was no agreement between the instruments for the evaluation of NAF.
Keywords: Motor Activity. Faculty. Sedentary Lifestyle.

RESUMO
As doenças cardiovasculares são as principais causas de óbito nacional, sendo o sedentarismo um importante fator de risco neste processo degenerativo. O objetivo foi avaliar o nível de atividade física (NAF) de docentes na rede pública de ensino de Viçosa MG por meio de dois instrumentos distintos e a concordância obtida entre eles. Participaram desta investigação 200 professores de ambos os sexos, com idade entre 25 e 68 anos. O NAF foi mensurado pelo Questionário Internacional de Atividade Física (IPAQ) e por meio da utilização de um pedômetro. Foram realizados os cálculos das prevalências de indivíduos ativos e não ativos fisicamente e posteriormente o índice Kappa (K) para estabelecer a concordância entre os instrumentos. Todas as análises foram realizadas no software MedCalc, versão 14. 10. 2 e SPSS, versão 20. Pelo IPAQ, 70% dos professores atingiram níveis adequados de atividade física (AF), enquanto, pelo pedômetro apenas 26.5%. A concordância entre as cinco categorias do pedômetro e do IPAQ não foi significativa, assim como na classificação em ativos e não ativos, entre os instrumentos. Conclui-se que avaliando o NAF através do IPAQ foi possível perceber que a maioria dos docentes foram classificados como ativos. Entretanto quando se considera o limiar de 10000 passos/dia de média, utilizando o pedômetro como instrumento de avaliação do NAF, a maior parte do grupo não pode ser considerada ativa. Além disso, não houve concordância entre os instrumentos para a avaliação do NAF.
Palavras Chave: Atividade Motora. Docentes. Estilo de Vida Sedentário.

Introduction

Cardiovascular diseases (CVD) are the main causes of death in Brazil, accounting for 31% of all recorded deaths[1]. Several factors contribute to increasing the prevalence of these diseases in the population, such as tobacco smoking, inadequate diet and sedentary lifestyle. The latter, in turn, is considered a primary risk factor for the development of CVD, being strongly associated with the genesis and worsening of these comorbidities[2].

According to the American College of Sports Medicine[3], 150 minutes of moderate physical activity (PA) or 75 minutes of intense PA every week are enough to reduce risks and produce cardiovascular health benefits, and this activity can be performed in a continuous or interrupted way.

Individuals who meet the minimum recommendation for weekly physical activity, in addition to being at a lower risk of developing various diseases, are also important allies of public health. It is estimated that, besides needing to use the Brazilian Unified Health System (SUS) less frequently, they generate lower expenses with medicines and treatments as well, helping save 7,000 BRL per 100 users[4,5]. Furthermore, even walking is associated with lower medication, laboratory test and consultation costs[6,7].

Level of physical activity (LPA) can be measured by means of questionnaires such as the International Physical Activity Questionnaire (IPAQ); physiological indicators (heart rate and oxygen consumption); motion sensors (pedometers and accelerometers); and biological markers (doubly-labeled water and Computer Science Application)[8]. However, when it comes to epidemiological research, in which the vast majority of investigations assess large populations, it is necessary to employ instruments with low operating costs and of easy application.

In these studies, in which LPA was assessed, the IPAQ[9,10] and Pedometers[11-14] are frequently used, with both instruments being easy to apply and of relatively low cost, thus becoming very interesting options for this type of research.

Studies that have used the IPAQ as an instrument to assess LPA have observed high prevalence of active individuals. In a study with teachers in São Paulo, Brito et al[9] found that more than 53% of them had sufficient levels of physical activity. Colpani et al[15], assessing women in the climacteric period, found a percentage of active women close to 80%. On the other hand, in this same study, using the pedometer as an instrument to assess level of physical activity, approximately 68% of the assessed subjects were classified as physically inactive. Corroborating with these results, an investigation by Mantovani et al[11], with workers from a university and members of a gym in Presidente Prudente, observed that more than 80% of the participants did not reach the average of 10,000 steps/day, being classified as physically inactive. These results show a discrepancy between these instruments for level of physical activity assessment.

Investigations that seek to establish LPA in population groups of workers are an important tool in order to propose alternatives to maximize the benefits of an active lifestyle, since, according to data from the Brazilian Ministry of Health, mortality by CVD in the country reaches the working-age population more intensely than in countries like the United States and in Western Europe, which increases public expenditures, hospitalizations and treatments for these diseases[16].

Several studies that have assessed LPA with two different instruments have presented controversial results in relation to agreement. Rosa et al[17], investigating LPA by means of an accelerometer and the short version of the IPAQ, in postmenopausal women, found no agreement between the instruments. Colpani et al[15], assessing level of physical activity in postmenopausal women, through the short version of the IPAQ and a pedometer, verified poor agreement between them. Dallanezi et al[18], in turn, using the full version of the IPAQ and a pedometer, and Torquato et al[19], using the full version of the IPAQ and an accelerometer, in postmenopausal women with osteoporosis and seniors, respectively, found agreement between these instruments for LPA assessment.

In the population of basic education teachers, few studies have assessed this behavior. In addition to this scarcity, the vast majority of studies are concentrated in large population

centers[9,20], thus, there are few researches on level of physical activity in smaller cities' populations[13,21]. Moreover, investigations that have sought to verify agreement between different instruments in LPA assessment were not identified in the literature for the population in question, only in postmenopausal women[15,17,18] and in the elderly population[19]. In view of this, the objective of the present study was to assess the level of physical activity of teachers from Viçosa's public school system, in Minas Gerais, by means of two different instruments, as well as the agreement obtained between them.

Material and Methods

Participants

An observational study was carried out with a cross-sectional design in the population of elementary and high school teachers from the State and Municipal network of the city of Viçosa, Minas Gerais. Data collection comprehended the period from March to October 2013, after approval by the ethics committee on research involving humans of the Federal University of Viçosa (Of. Ref. No. 070/2012/CEPH), complying with Resolution No 466/12 of the National Health Council.

In 2012, the population of the State and Municipal network was made up by 728 teachers, of which only 10% were male, according to data from Viçosa's Secretary of Education, MG. The sample was calculated following the equation: $n = P \times Q / (E/1.96)^2$, where n is the minimum sample size required; P is the prevalence of the disease in the population; Q = 100 - P; and E is the sample margin of tolerance[22]. Thus, with a P of 0.15, which was found using the percentage mean of the different cardiovascular risk factors of Belo Horizonte's population, MG[23], with a standard error of 5% and a confidence interval of 95%, the value of 196 was obtained, which is equivalent to the minimum of teachers required.

The study counted with 200 male and female teachers from Viçosa's public school system, MG, aged between 25 and 68 years old. This total accounted for 26% of the universe of teachers, distributed in 8 schools – three municipal and five state schools – selected through a randomization process.

Procedures

Initially, the school board was informed about the dynamics of the study, the objectives and procedures that would be adopted in the research, and, then, all information was passed on to the teachers. This was done during break time, in the teacher's room, on different days to include as many teachers as possible at each school. The research objectives were informed, as well as all the dynamics to be carried out for data collection, making voluntariness and the possibility of leaving the research at any moment clear. Moreover, an invitation poster for the research, with all information as well as the researchers' contact details, was posted at each school. Those who agreed to participate were registered and underwent an analysis for inclusion criteria. Inclusion criteria were: being teachers from Viçosa's public network (state or municipal), MG, having at least 3 years of teaching experience, not being on medical or maternity leave, and having no metabolic impairment that could interfere with data collection and validity.

Data collection took place at the school itself, in a reserved room, at a pre-scheduled time with the teacher, being carried out by two assessors duly instructed to do so. At that moment, a free and informed consent was read, questions were answered and the respondent should sign it if he or she agreed with all the steps in the term. Subsequently, the IPAQ was

applied to obtain level of physical activity. Then, anthropometric measurements were performed and, finally, a pedometer was given to the participant to record the number of daily steps.

Anthropometric Assessment

To characterize the anthropometric profile of the sample, the body mass index (BMI) was calculated by dividing the weight by the square of the height[24]. Height was measured using a portable WCS® stadiometer, with a 1 millimeter precision; the subjects were weighed on a portable Plenna® scale, model AcquaSIM09190, with precision of 100 grams.

Body fat percentage (%G) was calculated by skinfold measurements. The technique for skinfold measurement and analysis followed the recommendations of Jackson and Pollock's protocol, with the measuring of three folds (Men: Chest, Abdomen and Thigh; Women: Triceps, Suprailiac and Thigh)[25,26], measured with a scientific skinfold caliper, model Cescorf®. Three alternate measurements were performed, considering the average value between them. Then, body density was converted into %G[27]. All anthropometric data were entered into the Avaesporte® program (Esporte Sistemas, MG, Brazil), with automatic calculation of body composition.

Level of Physical Activity Assessment

For LPA measurement, the International Physical Activity Questionnaire (IPAQ) was employed. Its short version was chosen because it has been validated for the Brazilian population[28,29].

The IPAQ was applied by two trained assessors that were prepared to clarify eventual doubts of the participants. The answers were collected and counted, and the individuals were later classified according to IPAQ recommendations[30] into 5 categories (Sedentary, Insufficiently active A and B, Active and Very active).

Another instrument used to measure the participants' LPA was the pedometer. For six consecutive days, the subjects used a Digi-Walker® Pedometer, Model CW-700 (Digi-Walker, Japan) (removed only when it was not possible to use it) to verify the number of daily steps. The use of this instrument was standardized in the hip region, on the right side of the body and attached to the pants waistband, having as reference the midline of the thighs, as per manufacturer's recommendations. The assessed participants received a record sheet, where they wrote down the length of time they were without the pedometer, and, at the end of each day, they wrote down the total number of steps.

In order to avoid the Hawthorne Effect, the first day of use was discarded from the analyses, and the mean of the 5 remaining days was calculated[14,31]. The individuals were classified according to number of daily steps, following the five classifications established by Tudor Locke et al.[14] (sedentary, less active, little active, active and very active).

Subsequently, the participants were classified as active if the result was ≥ 150 minutes per week, using the IPAQ, and ≥ 10,000 steps per day, using the pedometer. Those who did not comply with these recommendations were classified as non-active[28,30,32].

Statistical analysis

In the traditional classifications (sedentary, insufficiently active A, insufficiently active B, active and very active for the IPAQ; and sedentary, less active, little active, active and very active for the pedometer) and in the dichotomous classification (active and non-active) an Inter-

rater reliability analysis and kappa statistics were used to determine the agreement between the IPAQ and the pedometer.

Kappa values may range from 1 (perfect agreement) to a negative value[33]. Proposed a six-level scale to interpret kappa values, in which zero values are taken as poor agreement; 0.00 to 0.20 as light agreement; 0.21 to 0.40 as fair agreement; 0.41 to 0.60 as moderate agreement; 0.61 to 0.80 as good agreement; and values above 0.81 as near-perfect agreement.

The Mcnemar test was used to investigate differences in the proportion of participants that meet LPA recommendations with the pedometer and the IPAQ.

To calculate the prevalence of non-active subjects, the total number of subjects classified as non-active was divided by the total number of subjects in the sample[34]. All analyses were performed on MedCalc, version 14. 10. 2, and SPSS, version 20.

Results

A total of 200 people participated in this study, being 25 men and 175 women aged 43.65 years old on average. All of them met the inclusion criteria and were volunteers in the two situations in which LPA was investigated. Descriptive characteristics are displayed in Table 1.

Table 1. Characteristics of the sample of Viçosa's public network teachers, MG, Brazil. (N=200).

Variables	Men *n*= 25	Women *n*= 175	Total *n*=200
Age(years)	39.76 ± 9.45	44.20 ± 9.91	43.65 ± 9.94
Height (cm)	1.73 ± 0.05	1.59 ± 0.06	1.61 ± 0.07
Weight (Kg)	76.29 ± 9.92	66.96 ± 12.94	68.12 ± 12.95
BMI (Kg/m^2)	25.41 ± 3.04	26.40 ± 4.97	26.27 ± 4.77
%G (%)	20.09 ± 5.14	32.48 ± 6.42	30.93 ± 7.49

BMI: Body Mass Index; %G: Body fat percentage
Source: The authors.

Level of Physical Activity Assessment according to the five IPAQ and Pedometer classifications, and the agreement between instruments.

Based on data obtained with the short version of the IPAQ, the subjects were classified as: sedentary, insufficiently active A, insufficiently active B, active and very active.

On the other hand, by the pedometer, the participants were classified into five categories: sedentary, less active, little active, active and very active.

Table 2 shows a comparison of the assessed LPA through the IPAQ and the Pedometer between genders.

Table 2. LPA comparison by the IPAQ and the Pedometer in teachers from Viçosa's public network, MG, Brazil, by sex. (N=200).

Instrument/Classification	Men %	Women %	P-Value
IPAQ			**0.053**
Sedentary	4	4.6	
Insufficiently Active A	12	17.7	
Insufficiently Active B	24	6.3	
Active	52	65.7	
Very Active	8	5.7	
Pedometer			**0.043***
Sedentary	12	22.3	
Less Active	20	28.6	
Little Active	24	25.1	
Active	20	17.7	
Very Active	24	6.3	

* $p < 0.05$
Source: The authors

Figure 1 shows the average number of steps according to the five classifications proposed by the IPAQ. Thus, it is possible to observe, according to the means of number of steps, that the group of individuals classified as sedentary, active and very active by the IPAQ, present values that would classify them as little active by the pedometer. Those classified as insufficiently active A and B by the IPAQ, in turn, would be classified as less active by the pedometer.

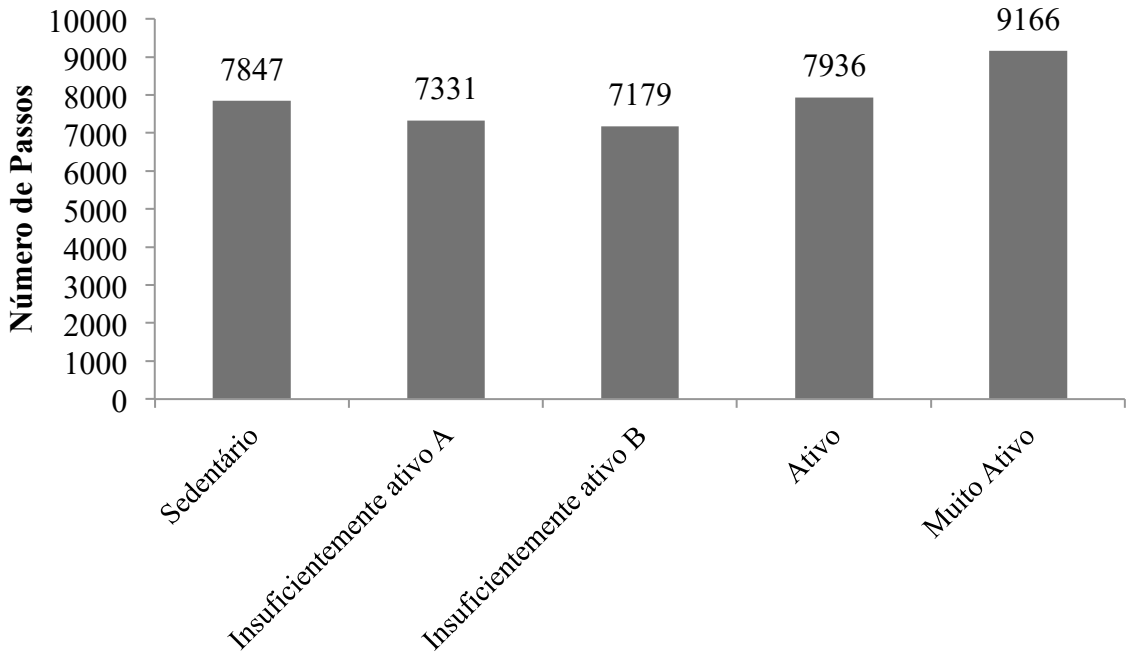

Figure 1. Mean of the number of steps of Viçosa's public network teachers, MG, Brazil, according to classification proposed by the IPAQ. (N=200).
Source: The authors

Assessing the agreement between the five Pedometer and IPAQ categories, the instruments did not show significant agreement (Kappa = 0.009, p = 0.759).

Level of Physical Activity Assessment according to two IPAQ and Pedometer general classifications, and the agreement between instruments.

After data categorization, the subjects were classified as active and not active. The proportion of participants classified as active varied when determined by the IPAQ (70%) and the pedometer (26.5%) (Figure 1). Considering the pedometer as reference criterion, the IPAQ tends to overestimate the number of participants classified as active (McNemar chi-square = 66.63, p <0.001).

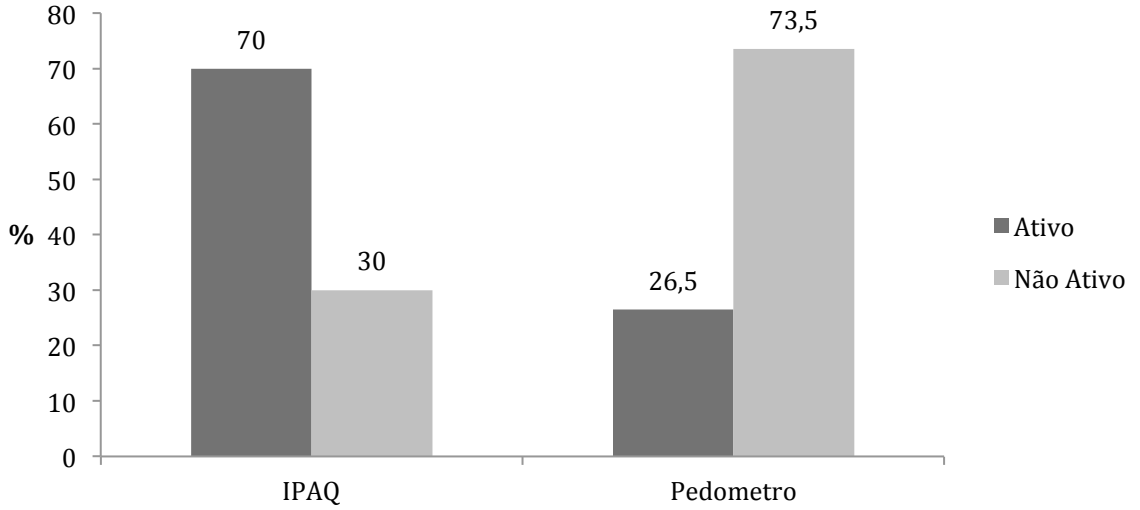

Figure 2. Dichotomous classification of Physical Activity Level, by the IPAQ and Pedometer, of Viçosa's public network teachers, MG, Brazil (N=200).
Source: The authors

The agreement between the IPAQ and the pedometer was not significant (Kappa = 0.066, p = 0.223).

Discussion

The present study presents the LPA of Viçosa's basic education teachers, MG. By means of these results it is possible to perceive a discrepancy in this behavior when the latter is analyzed by different instruments. The results obtained through the IPAQ (Figure 1) show that 70% of the teachers were classified as physically active, corroborating with findings by Rosa et al[17], which showed a high prevalence of this behavior in postmenopausal women. These results suggest that the IPAQ tends to overestimate physical activity time in moderate and vigorous activity and to underestimate it in activities of moderate intensity[17]; however, further studies are necessary to confirm this hypothesis.

The use of questionnaires, such as the IPAQ, in research has positive and negative aspects. As a positive one we can highlight the comprehension of a large sample, since it is of easy application and low cost. However, answers can be manipulated by the respondent, who lies and/or omit information[35]. In addition, this instrument tends to overestimate activity level and it has been presenting low agreement when compared to LPA objective measurement

instruments[15,17], becoming a fragile and inconsistent tool to assess this behavior[17,36]. Hence the importance of instruments that objectively measure level of physical activity.

Given these limitations of the questionnaires, we can select objective instruments for level of physical activity assessment, such as pedometers. Pedometers are devices sensitive to the vibration caused by hip movement during gait, being widely used to assess LPA by means of number of steps[37-39].

This instrument has some advantages in its use, since it allows, at reduced costs, objective and accurate measurements of daily PA relative to displacements by foot. However, it also presents some limitations as it makes it impossible to assess activities such as cycling, water activities, and for not providing information on the duration, frequency and intensity of the activities[40,41].

In the present research, using the pedometer to assess level of physical activity, it was possible to observe that 73.5% of the teachers did not meet the minimum requirement of 10,000 steps per day on average to be classified as physically active.

In a study that assessed the number of steps in the employees of a university and members of a gym, a percentage of 12.9% of individuals was obtained, reaching the minimum recommendation of 10,000 steps per day[11]. These results corroborate with the findings of the present investigation.

Comparing the values obtained between the IPAQ and the Pedometer, it is possible to notice a discrepancy between data; by the IPAQ, 70% of the individuals were categorized with adequate levels of PA practice, whereas, by the pedometer, this percentage was 26.5%.

In a cross-sectional investigation with women in the climacteric period, from the South of Brazil, similar results were found as to prevalence of active individuals (74% and 31%) and non-active individuals (26% and 68.2%) in both instruments, respectively, corroborating the findings of this research[15]. Such behavior seems to be influenced by positive and negative aspects inherent to each one of the instruments used to analyze the teachers' physical behavior.

In addition to the similar behavior in relation to prevalence of active and non-active individuals, Colpani et al.[15] also compared the agreement between different instruments in LPA assessment. In said comparison, the researcher found a weak agreement between instruments (Kappa = 0.110; p = 0.007), which is not in line with the results obtained in the present investigation, which found no agreement between them (Kappa = 0.066, p = 0.223).

Dallanezi et al.[18], corroborating results obtained by Colpani et al.,[15] observed a weak agreement (Kappa = 0.21) between the two LPA analysis instruments in a postmenopausal population with osteoporosis. The lack of agreement between instruments, obtained between both abovementioned investigations and the present one, can be attributed to methodological incompatibilities. In Colpani et al.,[15], the cut-off point adopted for level of physical activity classification by the pedometer differed from the cut-off point adopted in the present investigation (6,000 vs 10,000 steps/day on average). Concerning Dallanezi et al.,[18] the methodological difference occurred in the use of the full version of the IPAQ, while the present research resorted to the short one.

There is a number of studies that have assessed level of physical activity in the Brazilian population[4-7,9,11,12,17-20,28]. However, investigations that have assessed it with different instruments are scarce in the national literature[15,17-19]. In addition, the present research sought to identify the level of physical activity in teachers, using and comparing the pedometer and the IPAQ. In the national literature, few investigations have presented a similar research model, but still with methodological and population differences[15,18]. Besides, the present study compared both instruments in their 5 initial classifications (Pedometer: sedentary, less active, little active, active and very active; IPAQ: sedentary, insufficiently active A, insufficiently active B, active and very active) and their 2 general classifications (Active and Non-active), thus making it a

pioneer among Brazilian studies that have assessed level of physical activity by different instruments, equipped with relevant and new data.

Considering the role of regular physical exercise, an easily adopted behavior, in the prevention of cardiovascular diseases, it is essential and necessary that accurate instruments of LPA estimation are employed as an indispensable tool in interventions aimed at changing habits.

It is worth stressing that the results obtained in the comparison between these two instruments should be analyzed with caution, since the IPAQ measures LPA by means of time (minutes) of activity, and the pedometer by means of number of steps. Because they are different units, there might be errors in this comparison. However, other studies have already been carried out based on these same units, corroborating with the findings of the present investigation[15,18].

An interesting approach that could further enhance the analytical capacity of LPA studies would be heart rate monitoring. Through the behavior of this variable, it would be possible to observe the magnitude of daily activities and thus to determine which of the two instruments best represents the teachers' level of physical activity. However, due to the large number of assessed subjects (N=200), such procedure became unviable. Because the present study assessed LPA in basic education teachers from Viçosa's public network, it is necessary to carry out this same study model in populations of private school teachers, as well as teachers from the federal education network. This will allow for a broad and representative demographic perspective for all classes of teachers in the municipality of Viçosa, MG.

Conclusions

Assessing LPA through the IPAQ, it was possible to find that the majority of the teachers were classified as physically active. However, when the threshold of 10,000 steps per day on average is considered, using the pedometer as an LPA assessment method, the vast majority of the group cannot be considered as physically active. In addition, there was no agreement between the instruments for LPA assessment, and it is worth highlighting that the IPAQ tends to overestimate the level of physical activity in the studied population.

References

1. Schmidt MI, Duncan BB, Azevedo e Silva G, Menezes AM, Monteiro CA, Barreto SM, et al. Doenças crônicas não transmissíveis no Brasil: carga e desafios atuais. Lance 2011;377(9781):1949–1961.
2. Wilmore JH, Costill DL. Fisiologia do esporte e do exercício. 2. ed. São Paulo: Manole; 2001.
3. Garber CE, Blissmer B, Deschenes MR, Franklin BA, Lamonte MJ, Lee IM, et al. Quantity and quality of exercise for developing and maintaining cardiorespiratory, musculoskeletal, and neuromotor fitness in apparently healthy adults: Guidance for prescribing exercise. Med Sci Sports Exerc 2011;43(7):1334–1359.
4. Codogno JS, Fernandes RA, Sarti FM, Freitas Júnior IF, Monteiro HL. The burden of physical activity on type 2 diabetes public healthcare expenditures among adults: a retrospective study. BMC Public Health 2011;11(275): 1–7.
5. Codogno JS, Fernandes RA, Monteiro HL. Prática de atividades físicas e custo do tratamento ambulatorial de diabéticos tipo 2 atendidos em unidade básica de saúde. Arq Bras Endocrinol Metabol 2012;56(1):6–11.
6. Codogno JS, Turi BC, Kemper HCG, Fernandes RA, Christofaro DGD, Monteiro HL. Physical inactivity of adults and 1-year health care expenditures in Brazil. Int J Public Health 2015; 60: 309–306.
7. Turi BC, Codogno JS, Fernandes RA, Henrique Luiz Monteiro. Caminhada e gastos com saúde em adultos usuários do sistema público de saúde brasileiro: estudo transversal retrospectivo. Cien Saude Colet 2015;20(11):3561–3568.
8. Amorim PRS, Gomes TNP. Gasto energético na atividade física. 1. ed. Rio de Janeiro: Shape; 2003.
9. Brito WF, Santos CL dos, Marcolongo A do A, Campos MD, Bocalini DS, Antonio EL, et al. Nível de atividade física em professores da rede estadual de ensino. Rev Saude Publica 2012;46(1):104–109.

10. Polisseni ML de C, Ribeiro LC. Exercício físico como fator de proteção para a saúde em servidores públicos. Rev Bras Med do Esporte 2014;20(5):340–344.
11. Mantovani AM, Duncan S, Codogno JS, Lima MCS, Fernandes RA. Different Amounts of Physical Activity Measured by Pedometer and the Associations With Health Outcomes in Adults. J Phys Act Health 2016;13(11):1183-1191.
12. Oliveira M, Moura B, Marins J, Juvêncio J, Amorim P. Nível de atividade física habitual e laboral estimada por pedômetros. Rev bras ativ fís saúde 2011;16(3):188–92.
13. Oliveira RAR, Mota Júnior RJ, Tavares DDF, Moreira OC, Marins JCB. Fatores associados à hipertensão arterial em professores da educação básica. Rev Educ Fís UEM 2015;26(1):119–129.
14. Tudor-Locke C, Hatano Y, Pangrazi RP, Kang M. Revisiting "how many steps are enough?" Med Sci Sports Exerc 2008;40(7 SUPPL.1):s537-43.
15. Colpani V, Spritzer PM, Lodi AP, Dorigo GG, Miranda IAS, Hahn LB, et al. Physical activity in climacteric women: Comparison between self-reporting and pedometer. Rev Saude Publica 2014;48(2):258-265.
16. Ministério da Saúde [Internet]. Dados de saúde- DATASUS 2015. [acesso em: 20 de agosto de 2016]. Disponível em: http://tabnet.datasus.gov.br/cgi/deftohtm.exe?sih/cnv/niuf.def.
17. Rosa CSC, Rossi FE, Buonani C, Fernandes RA, Monteiro HL, Junior IFF. The agreement between physical activity time reported by the IPAQ and accelerometer in postmenopausal women. Motri 2015;11(3):106–113.
18. Dallanezi G, Corrente JE, Freire BF, Mazeto GMF da S. Concordância do International Physical Activity Questionnaire com o pedômetro, em mulheres pós-menopausadas portadoras de osteoporose. Rev Bras Clínica Médica 2011;9(2):93–96.
19. Torquato E, Gerage A, Meurer S, Borges R, Silva M, Benedetti T. Comparação do nível de atividade física medido por acelerômetro e questionário IPAQ em idosos. Rev Bras Ativ Fís Saúde 2016;21(2):144-153.
20. Canabarro LK., Neutzling MB., Rombaldi AI. Nível de atividade física no lazer dos professores de educação física do ensino básico. Rev Bras Ativ Fís Saúde 2011;16(1):11–17.
21. Folle A, Farias G. Nível de qualidade de vida e de atividade física de professores de escolas públicas estaduais da cidade de Palhoça (SC). REMEFE 2012;11(1):11–21.
22. Lwanga SK, Lemeshow S. Sample size determination in health studies A practicle manual. Genebra: World Health Organization; 1991.
23. Ministério da Saúde [Internet]. Vigilância de fatores de risco e proteção para doenças crônicas por inquérito telefônico, Vigitel Brasil 2010 [acesso em 13 de agosto de 2016]. Disponível em: http://bvsms.saude.gov.br/bvs/publicacoes/vigitel_2010.pdf
24. World Health Organization. Clinical guidelines on the identification, evaluation, and treatment of overweight and obesity in adults. The Evidence Report, NIH. Arch Intern Med. 1998;158(Suppl 2):51S-209S.
25. Jackson AS, Pollock ML, Ward A. Generalized equation for perdicting body density of women. Med Sci Sport Exer 1980;12(3):175–82.
26. Jackson AS, Pollock ML. Generalized equations for predicting body density of men. Br J Nutr 1978;40(3):497–504.
27. Siri WE. Body composition from fluid paces and density: analysis of methods. In: Brozeck J, Henschel A. Techniques for measuring body composition. Washington: National Academy of Science; 1961. p. 223-24.
28. Matsudo S, Araújo T, Matsudo V, Andrade D, Andrade E, Oliveira LC, et al. Questionário internacional de atividade física (IPAQ): estudo de validade e reprodutibilidade no Brasil. Rev Bras Ativ Fís Saúde 2001;6(2):5–18.
29. Pardini R, Matsudo S, Araújo T, Matsudo V, Andrade E, Braggion G, et al. Validação do questionário internacional de nível de atividade física (IPAQ -versão 6): estudo piloto em adultos jovens brasileiros. Rev Bras Ciên e Mov 2001;9(3):45–51.
30. Craig CL, Marshall AL, Sjöström M, Bauman AE, Booth ML, Ainsworth BE, et al. International physical activity questionnaire: 12-Country reliability and validity. Med Sci Sports Exerc 2003;35(8):1381-1395.
31. Corder K, Ekelund U, Steele RM, Wareham NJ, Brage S. Assessment of physical activity in youth. J Appl Physiol 2008;105(3):977-987.
32. Tudor-Locke C, Craig CL, Aoyagi Y, Bell RC, Croteau K, Bourdeaudhuij I, et al. How many steps/day are enough? For older adults and special populations. Int J Behav Nutr Phys Act 2011;8(1):79-96.
33. Landis JR, Koch GG. The measurement of observer agreement for categorical data. Biometrics 1977;33(1):159-174.
34. Malleta CHM. Bioestatística: Saúde Pública. 4. ed. Belo Horizonte: Do autor; 2009.
35. Lee PH, Macfarlane DJ, Lam T, Stewart SM. Validity of the international physical activity questionnaire short form (IPAQ-SF): A systematic review. Int J Behav Nutr Phys Act 2011;8(115):1–11.
36. Claumann GS, Pereira ÉF, Pelegrini A. Prática de caminhada, atividade física moderada e vigorosa e fatores associados em estudantes do primeiro ano de uma instituição de ensino superior. Motri 2014;10(4):16–26.

37. Thorup C, Hansen J, Gronkjaer M, Andreasen JJ, Nielsen G, Sorensen EE, et al. Cardiac Patients' Walking Activity Determined by a Step Counter in Cardiac Telerehabilitation: Data From the Intervention Arm of a Randomized Controlled Trial. J Med Internet Res 2016;18(4):1-13.
38. Vallance J, Eurich D, Gardiner P, Taylor L, Johnson S. Associations of Daily Pedometer Steps and Physical Activity With Health-Related Quality of Life : Results From the Alberta Older Adult Health Survey. J Aging Health 2016;28(4):661-674.
39. Oliveira RAR, Mota Júnior RJ, Tavares DDF, Moreira OC, Lima LM, Roberto P, et al. Prevalence of obesity and association of body mass index with risk factors in public school teachers. Rev Bras Cineantropom Desempenho Hum 2015;17(6):742-752.
40. Oliveira MM, Maia JA. Avaliação da actividade física em contextos epidemiológicos . Uma revisão da validade e fiabilidade do acelerómetro Tritrac – R3D , do pedómetro Yamax Digi-Walker e do questionário de Baecke . Rev Port Ciênc Desporto 2001;1(3):73–88.
41. Butte NF, Ekelund U, Westerterp KR. Assessing Physical Activity Using Wearable Monitors: Measures of Physical Activity. Med Sci Sport Exerc 2009;44(1supple 1):s5–12.

Acknowledgements: Foundation for Research Support of the State of Minas Gerais- FAPEMIG

Received on Feb, 07, 2017.
Reviewed on Mar, 25, 2017.
Acceptes on Ap, 17, 2017.

Author address: Rômulo José Mota Júnior, Doutor Felício Brandi 40, Ap. 203, Bairro Centro, Viçosa, MG, CEP 36570-000.
E-mail: romuloefi@gmail.com