Level of Physical Activity Knowledge of Medical Students in a Brazilian University

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Background: Physical inactivity is a major global public health problem, with a large impact on morbidity and mortality. For this reason, knowledge and advice on physical activity (PA) should be common to all health professionals. In this context, the role of physicians stands out, because they act in the first contact and have a high potential in addressing this issue and its impact on health promotion, prevention, and treatment in chronic diseases. This study aims to observe the level of physical activity knowledge of medical students in a university in the south of Brazil.

Methods: A cross-sectional study was carried out by applying the short and validated version of the International Physical Activity Questionnaire (IPAQ) to collect data on sociodemographic factors, physical activity, knowledge of physical activity, and level of physical activity.

Results: A total of 294 students were assessed. The average (± SD) age was 22.0 (± 3.3) years. Most were women, and 72.8% presented body mass index within the range 18.5-25 kg/m². Results showed that 65.6% of the students practice physical activity. There was statistical difference regarding the level of physical activity (p < 0.001) and sitting time on weekdays (p = 0.031) between the groups of physically active and physically inactive individuals.

Conclusion: It was concluded that the practice of physical activity has no association with the level of knowledge about it. However, by practicing physical activities doctors are better able to motivate and encourage their patients.

Key Words: Motor activity, Exercise, Knowledge, Medical students

INTRODUCTION

Physical inactivity is a major global public health problem that leads to increased morbidity and mortality. Lack of physical activity (PA) contributes to 3.2 million deaths in the world each year, being the fourth main risk factor for mortality [1]. However, this number could be reduced if more people adopted an active lifestyle, which significantly reduces the risk of developing chronic non-communicable diseases (NCDs), such as heart disease, type 2 diabetes, and certain types of cancer [2]. Physical activity is also one of the pillars for the treatment of various diseases, greater longevity, and better quality of life [3].

According to the World Health Organization (WHO), healthy adults should practice at least 150 minutes of moderate-intensity aerobics per week. However, one in every four adults is still physically inactive [1]. This profile is related to changes in lifestyle and facilities arising from technology, such as the use of automobiles, the habit of watch-
ing television, and the use of computers and video games [4]. A few factors associated to physical inactivity are: female gender, elderly age, obesity, poor health perception, poor education, and socioeconomic level [5,6].

Adequate guidance on the practice of PA is highly relevant to inform individuals about its benefits in improving their quality of life and preventing NCDs. When PA is systematized and oriented towards a specific objective, it is called physical exercise (PE). Therefore, an adequate prescription of PE regarding the type of PA, duration, intensity, and frequency can have even more positive effects on physical fitness [6,7].

Among the factors responsible for individuality in physical performance, maximum oxygen consumption (VO₂ max) stands out [8]. This is the most important factor for prescribing and assessing cardiorespiratory fitness, as it is modifiable and directly associated with the practice of PA and PE [6,8]. Higher VO₂ max levels are related to lower mortality rates, since people who practice PA regularly have greater cardiorespiratory fitness and, consequently, a greater functional reserve than those who are physically inactive. This is a protective factor against adverse events [8,9]. Thus, the adequacy of moderate aerobic activities can result in an improvement in the individual’s health status, mainly as prevention for cardiovascular and chronic diseases [10].

In this context, assessing the population’s level of PA becomes relevant to educate and promote improvements in health [11]. There are several ways to monitor PA. Among these, questionnaires stand out due to their simplicity [12]. They can offer data on duration, frequency, and type of activity, which makes it easier to classify activities as mild, moderate, or vigorous [12]. The International Physical Activity Questionnaire (IPAQ) estimates the weekly time spent on activities of moderate and vigorous intensity in various contexts that include work, leisure, domestic tasks, and passive activities [12]. By using an easy-to-fill questionnaire it is possible to identify the level of PA of a population or specific group and prevent diseases caused by inactivity [13].

When approaching an individual about PA practice, the guidance of a multi-professional health team is essential, especially doctors, who make the first contact with patients and have a high potential to address this issue and its impact on health promotion, as well as on the prevention and treatment of chronic diseases [14]. These professionals are seen as reliable and respected sources with regard to health-related information. In this way, they can motivate patients and increase the number of people who practice physical activities [15].

In light of the above, verifying the level of knowledge that medical students have about the importance of PA is crucial to reveal their perceptions and possible implications in clinical practice. It is known that this type of knowledge is only part of the expression of behavior and health promotion since there is a strong relationship between personal behaviors regarding PA and the counseling on this subject [11,15]. A study by Lobelo et al. [15] strongly demonstrated that physically active doctors and students are more likely to advise patients on these activities and value this practice as both a preventive and therapeutic tool. The implementation of interventions at universities can help to increase the number of medical students who adopt this habit, using this resource to expand the prevalence of individuals who practice physical activities and the quality of their future medical advice.

In this sense, the aim of this study was to assess how PA knowledge, PA level, sociodemographic factors, and anthropometric characteristics associate with the practice of PA by medical students in a university in the south of Brazil.

**MATERIALS AND METHODS**

This research consisted of an observational study with cross-sectional design, carried out at University of Southern Santa Catarina (UNISUL), Tubarão campus, between the months of March and June 2019. The study group consisted of medical students aged 18 years or older who were regularly enrolled from the first to the eighth course semester on the aforementioned university campus.

Students who refused to answer the questionnaire and those who were absent from the classroom when the questionnaire was applied were excluded.

Data were obtained through the application of a questionnaire, which was divided into three sections. The first included the participant’s general data, such as gender, age, current semester in the course, weight in kilograms and
height for calculating the body mass index (BMI = weight/height²), presence of comorbidities, frequency of sports practice, and type of sport.

A validated questionnaire was applied regarding the participant’s level of PA knowledge [16]. This instrument has a knowledge score ranging from 0 to 25 points, with 9 closed-ended, multiple-choice questions. The first and the last questions are not scored, as they are only a perception analysis. There are also questions about the physical activities recommended by the WHO.

The short version of the IPAQ [17] was applied in order to obtain the participant’s level of PA, by means of questions concerning to three levels of activity (walking, moderate exercise, and vigorous exercise) as well as their quantification in weekly frequency and daily hours.

The following values were used to obtain the level of total PA in MET-minutes per week. Walking = 3.3 METs, moderate exercise = 4.0 METs, and vigorous exercise = 8.0 METs. The calculation of total PA was the sum: walking + moderate exercise + vigorous exercise, in MET-minutes.

The participant’s level of PA was characterized as follows: Low: when not greater than 600 MET-minutes per week; Moderate: when between 600 and 1500 MET-minutes per week; and High: when greater than 1500 MET-minutes per week.

Before answering the questionnaire anonymously, the participants signed a free and informed consent term. The project was submitted to evaluation by the UNISUL Research Ethics Committee following the guidelines and regulatory norms for research involving human beings, proposed by the Resolution of the National Health Council No. 466/2012. It was approved under Report No. 3,141,721.

Data were tabulated on Excel© 2010 and analyzed on statistical program SPSS© 20.0. Quantitative variables were described by using measures of central tendency and dispersion. Categorical variables were described in absolute numbers and proportions. Either the chi-square test or Fisher’s exact test was used for data comparison, along with analysis of variance (ANOVA), depending on the type of variable. The alfa error considered was 5%.

### Table 1. Characteristics of the medical students in the study

| Variables              | n (%)     | Average (± SD) |
|------------------------|-----------|----------------|
| Age                    | 22.0 (± 3.3) |               |
| Gender                 |           |                |
| Male                   | 96 (32.7) |               |
| Female                 | 198 (67.3) |               |
| BMI (kg/m²)            | 22.5 (± 3.5) |               |
| ≤ 18.5                 | 23 (7.8)  |               |
| > 18.5 and ≤ 25        | 214 (72.8) |               |
| > 25 and ≤ 30          | 43 (14.6) |               |
| > 30                   | 11 (3.7)  |               |
| Phase                  |           |                |
| 1                      | 37 (12.6) |               |
| 2                      | 52 (17.7) |               |
| 3                      | 35 (11.9) |               |
| 4                      | 27 (9.2)  |               |
| 5                      | 44 (15.0) |               |
| 6                      | 29 (9.9)  |               |
| 7                      | 40 (13.6) |               |
| 8                      | 30 (10.2) |               |
| Comorbidity            |           |                |
| Yes                    | 42 (14.3) |               |
| No                     | 252 (85.7) |               |
| Type of comorbidity    |           |                |
| Asthma                 | 6 (2.0)   |               |
| Psychiatric disorders  | 6 (1.8)   |               |
| Hypothyroidism         | 6 (2.0)   |               |
| Rhinitis               | 4 (0.9)   |               |
| SAH                    | 2 (0.7)   |               |
| Others*                | 18 (6.9)  |               |
| Sports practice        |           |                |
| Yes                    | 193 (65.6) |               |
| No                     | 101 (34.4) |               |
| Type of sport          |           |                |
| Gym workout            | 90 (29.9) |               |
| Jogging                | 14 (4.6)  |               |
| Volleyball             | 16 (5.3)  |               |
| Soccer                 | 26 (8.6)  |               |
| Functional exercises   | 16 (5.6)  |               |
| Others†                | 31 (11.6) |               |
| IPAQ (MET-minutes/week)| 2,174.88 (± 2,862.75) |         |
| 1 (< 600)              | 68 (23.1) |               |
| 2 (600-1500)           | 82 (27.9) |               |
| 3 (> 1500)             | 133 (45.2) |              |
| Sitting time on weekdays (h) | 8.92 (± 2.5) |   |
| Sitting time on weekends (h) | 7.37 (± 3.3) |   |

*aOthers: migraine, type 1 diabetes mellitus, autoimmune arthritis, spondylolisthesis, scoliosis, kidney disease, epilepsy, hypercholesterolemia, psoriasis, bruxism, vascular disease, obesity, hyperthyroidism, and ankylosing spondylitis.
†Others: crossfit, thai boxing, basketball, yoga, surfing, ballet, hiit, swimming, boxing, cycling, futsal, handball, beach tennis, dancing, pilates and jiu-jitsu.
RESULTS

A total of 294 students were evaluated, with an average (± SD) age of 22.0 (± 3.3) years. Most were women (67.3%). A small part of the students reported having some type of comorbidity (14.3%). Most students (65.6%) stated that they practice sports on a daily basis. As for their BMI, 72.8% were in the range between 18.5 and 25 kg/m², which is classified as normal weight. Among the students, 45.2% were in the range of high level of PA (over 1500 MET-minutes per week). Data concerning to sitting time on weekdays, sports, and information on PA are shown in Table 1.

Table 2. Medical students’ knowledge of physical activities

| Variables                                                                 | n (%)         | Average (± SD) |
|---------------------------------------------------------------------------|---------------|----------------|
| PA knowledge score                                                       | 21.13 (± 2.35) |
| Question A - Do you agree that physical activity is “any bodily movement produced by skeletal muscles that requires energy expenditure - including activities performed while working, playing, doing household chores, traveling and engaging in recreational activities”? |               |
| No                                                                       | 94 (32.0)     |
| Yes                                                                      | 198 (67.3)    |
| Question B - Children and adolescents should practice at least how many minutes of moderate to vigorous physical activity per day? | 47.6 (± 38.5)* |
| 60 minutes                                                               | 56 (19.0)     |
| Others                                                                   | 234 (79.6)    |
| Question C - Adults should practice at least how many minutes of moderate physical activity per week? | 113.89 (± 70.39)* |
| 150 minutes                                                              | 64 (21.8)     |
| Others                                                                   | 226 (76.9)    |
| Question D - Do you agree that physical inactivity by itself is considered a risk factor for the development of chronic non-communicable diseases? |               |
| I agree                                                                  | 264 (89.8)    |
| I disagree                                                               | 28 (9.5)      |
| Question E - “Adults over 65 should not engage in physical activity due to their lower cardiorespiratory condition and muscle weakness”. |               |
| False                                                                    | 289 (98.3)    |
| True                                                                     | 4 (1.4)       |
| Question F - “Educational practices in schools have no consistent value for encouraging children and adolescents to look for ways to practice activities outside the school environment”. |               |
| False                                                                    | 273 (92.9)    |
| True                                                                     | 20 (6.8)      |
| Opinion on PA knowledge                                                  |               |
| I do not think it is necessary                                           | 4 (1.4)       |
| I have no knowledge of it                                                | 2 (0.7)       |
| I know enough about it                                                   | 68 (23.1)     |
| I wish to know more about it                                             | 219 (74.5)    |
| Information on PA                                                        |               |
| No                                                                       | 27 (9.2)      |
| Yes                                                                      | 266 (90.5)    |
| Who informed you?                                                        |               |
| 1 (Everybody)                                                            | 177 (60.2)    |
| 2 (Doctor)                                                               | 51 (17.3)     |
| 3 (Relative/Friend)                                                      | 57 (19.3)     |
| 4 (Teacher)                                                              | 32 (10.9)     |
| 5 (Media)                                                                | 48 (16.3)     |
| 6 (No information)                                                       | 27 (9.2)      |

PA: physical activity.

*Minutes.
The average score for the level of PA knowledge was 21 (± 2.35). When asked about PA being any body movement produced by skeletal muscles, 67.3% of participants agreed. Regarding the estimated minimum PA time for children and adolescents, only 19% of students knew the correct answer. Concerning to the estimated minimum PA time for adults, 21.8% answered correctly. When asked about physical inactivity being considered a risk factor for the development of chronic non-communicable diseases, the percentage of correct answers was 89.8%. When asked whether adults over 65 should not practice PA due to their lower cardiorespiratory fitness and muscle weakness, 98.3% considered the statement false. When it was stated that educational practices in schools do not have a consistent value for encouraging children and adolescents to seek other ways to practice PA outside the school environment, 92.9% of the students did not agree. Regarding information about PA, 90.5% of the students answered that they already had access to information. The people who most transmit this type of information were friends or relatives (19.3%), and doctors (17.3%). A high percentage of students (74.5%) stated they would like to know more about the subject (Table 2).

| Table 3. Comparison between physically active and inactive students |
|---------------------------------------------------------------|
| **Inactive** | **Active** | **p** |
| **N (%)** | **N (%)** |  |
| Age (years)* | 21.9 (± 3.7) | 22.0 (± 3.1) | 0.904 |
| Gender |  |  |  |
| Male | 28 (29.2) | 68 (70.8) | 0.192 |
| Female | 73 (36.9) | 125 (63.1) |  |
| BMI (kg/m²)* | 22.6 (± 4.3) | 22.9 (± 3.0) | 0.660 |
| MET-minutes/week* | 829.5 (± 1,367.7) | 2,844.0 (± 3,164.2) | < 0.001 |
| Sitting time (weekdays)* | 9.4 (± 2.6) | 8.6 (± 2.4) | 0.031 |
| Sitting time (weekends)* | 7.4 (± 3.1) | 7.3 (± 3.4) | 0.871 |
| PA knowledge score* | 20.9 (± 2.6) | 21.2 (± 2.2) | 0.414 |
| Comorbidity |  |  |  |
| No | 84 (33.3) | 168 (66.7) | 0.367 |
| Yes | 17 (40.5) | 25 (59.5) |  |
| Question A |  |  |  |
| No | 27 (28.7) | 67 (71.3) | 0.147 |
| Yes | 74 (37.4) | 124 (62.6) |  |
| Question B |  |  |  |
| 60 minutes | 18 (28.1) | 46 (71.9) |  |
| Others | 82 (36.3) | 144 (63.7) | 0.225 |
| Question C |  |  |  |
| 150 minutes | 14 (25.0) | 42 (75.0) |  |
| Others | 85 (36.3) | 149 (63.7) | 0.108 |
| Question D |  |  |  |
| False | 88 (33.3) | 176 (66.7) | 0.313 |
| True | 12 (42.9) | 16 (57.1) |  |
| Question E |  |  |  |
| False | 100 (34.6) | 189 (65.4) | 0.572 |
| True | 1 (25.0) | 3 (75.0) |  |
| Question F |  |  |  |
| False | 95 (34.8) | 178 (65.2) | 0.663 |
| True | 6 (30.0) | 14 (70.0) |  |
| Information on PA |  |  |  |
| No | 5 (18.5) | 22 (81.5) | 0.073 |
| Yes | 95 (35.7) | 171 (64.3) |  |

PA: physical activity, BMI: body mass index.

*Average (± SD).
When comparing students who practice sports with those who do not, there was a statistical difference in their level of PA (MET-minutes per week). Those who practice sports obtained an average of 2,844.0 (± 3,164.2), whereas students who do not practice sports presented an average of 829.5 (± 1,367.7). There was also a difference in sitting time on weekdays. Physically active students had an average of 9.4 (± 2.6) h, whereas physically inactive students had 8.6 (± 2.4) h. Other results are shown in Table 3.

**DISCUSSION**

The results of this research showed that most students who participated were young women. A study carried out in Aracaju, Brazil, at Tiradentes University, analyzed the level of PA of 187 medical students, of which 120 (64.2%) were women [18]. Another study, carried out in Thailand with medical students showed the predominance of female students, which is due to the increasing inclusion of women in the labor market seen in recent decades across that country, including in the health sector [19].

A study performed in Brazil by Scheffer & Casenote [20] on the feminization of medicine in this country showed that in the active group of doctors, the male gender was still the majority, however, in the group under 29 years old, women had greater strength. This has been happening since 2009, therefore, there is an increasing trend for women practicing medicine in Brazil.

It was evidenced that most of the medical students participating in the present study were in the normal BMI range, between 18.5 and 24.9 kg/m². Similarly, a study by Cruz et al. [18] also demonstrated that most students (73.8%) were within the appropriate weight range. Another study that corroborates the findings of this research was done by Santos et al. [21] including 55 medical students, of which 56.4% were within the appropriate weight range.

This percentage difference between studies may be due to the particularities of each region and population, such as climate, food, and habits. When comparing these data with those obtained by the 2018 Vigitel inquiry [22], where 55.7% of Brazilians were overweight (32.1% in the 18-24 age group) and 19.8% were obese (7.4% in the 18-24 age group) it can be seen that the population of the present study consists of individuals who are in a small group of people within a healthy weight range. Most students showed a high level of physical activity. A study conducted by Cruz et al. [18] with 187 medical students also presented a high level of PA among students (55.6%). Another study with similar results was carried out with 259 medical students in Bangalore, India [23], in which 41.3% of the individuals showed high levels of PA. The increase in this practice among medical students can be explained by the current trend of students’ awareness of the importance of a healthy lifestyle [24].

In regard to the time individuals spend sitting, the results of the present study corroborate those of a study carried out with 186 students at the Santa Casa de Sáão Paulo School of Medical Sciences (FCMSSCP) [25], which found that students spent 8.72 hours sitting on weekdays. There was a small difference between that result and the one found in the present study. Another similar finding in that research is the students’ sitting time on weekends, which was just 0.37 minutes longer than the value obtained in this study. These results can be explained by the high workload of studies that a medical school requires during the week and the time that students need to use during the weekend to complement activities.

The present study found that most students practice some type of sport. In contrast, in a research by Nardelli [26], carried out with 124 students in the health area, the result was that only 35.5% practiced PA. Several students reported lack of time to perform PA. Those who adhere to this habit reported that they do it for pleasure or aesthetics [18]. Another study that is consistent with a low percentage of university students who practice PA was carried out by Nobrega [27], with 383 students in the health area, of which only 41% reported that they practice PA frequently or always.

It can be noted that the level of PA practice varies between studies, which may be due to the difference in the number of hours of each course and university since some courses in the health area have fewer hours, and others include sports in their curriculum. However, when these data are compared with those obtained by the WHO [28], where only 1 in 4 (25%) adults practices PA, or with those obtained by the 2018 Vigitel inquiry [22] (38.1% of in-
individuals practice PA – 50.6% between 18 and 24 years old, it is clear that the sample of the present study is above the general average.

Regarding the PA knowledge score, assessed through a specific questionnaire, a higher average was obtained in the present study than in the study by Domingues et al. [16], conducted with a population of 3,182 people in the city of Pelotas, Rio Grande do Sul, Brazil, in which the average was 17.1 (± 4.0), 4 points below the average found in the present study. This may have occurred because the population of that research consisted of non-specialist individuals. When asked about their knowledge of PA, most students reported that they would like to know more about the subject. This result shows the need for education on the matter since after graduating, these students should be able to encourage and motivate their patients to practice physical activities.

Approximately 1/3 of the participants in the current study were unaware of the definition of PA. The results showed that only a small part of the students knew the amount of weekly PA practice indicated for adults by the WHO for an active lifestyle. A study coordinated by Mandic et al. [29] also found a low percentage (19%) of medical students who correctly knew the minimum PA recommendations for healthy adults. Contrary to the results found in the aforementioned studies, Dunlop & Murray [30] performed a research including 177 medical students from the United Kingdom and found that 68% of the respondents were able to correctly identify what is recommended by the United Kingdom guidelines. Even though that can be considered an expressive result, it can be stated that medical students today, who will soon become doctors, do not have the knowledge and skills necessary to guide and promote PA to their patients.

Most students reported that they had received information about how PA improves health. The most frequent answer about the source of this information was “Friends and Relatives”, and the second most frequent was “Doctors”. In the study by Dunlop & Murray [30] mentioned above, 74% of students said they had received some information about the benefits of PA during their undergraduate studies. However, despite this being a fairly reasonable number, most of these students did not show a solid knowledge of PA practice, and therefore would probably not be able to correctly inform their patients on how to achieve a healthy lifestyle.

With regard to the comparison between physically active and inactive individuals, a study by Padmapriya et al. [23] found that students with a high level of PA achieved at least 3,000 MET-minutes per week, which was similar to the result obtained in the present study. In other words, it demonstrated that sports practice is associated with a higher amount of MET-minutes per week. There was a difference in sitting time on weekdays between physically active and inactive individuals, which was also observed by Raddi et al. [25]. That leads us to assume that this difference is due to the time most students spend playing sports. However, the sitting time on weekends was similar, indicating that the moments of rest and leisure in this period are equivalent in both groups.

When analyzing the PA time recommended by the WHO for adults to maintain an active lifestyle, it was expected that physically active students would be able to answer correctly more frequently. No studies were found in the literature presenting the same result as the present study. However, that seems to demonstrate that the practice of sports is not related to adequate knowledge on the subject. Physically active and inactive students showed similar PA knowledge scores. This can be explained by the fact that even medical students who do not practice PA receive information from professors, doctors, and other professionals in the health area.

Results showed that physically active students receive more information about PA than physically inactive students. Perhaps by receiving this type of information, these students feel encouraged to adopt a healthier lifestyle.

It should be noted that the present study had a few limitations, such as the application of a self-report questionnaire, including variables as weight, height, and PA practice. Also, the questionnaire about PA knowledge was not specific enough for the health area.

**CONCLUSION**

It is concluded that the participants in the present study were mostly young and healthy women whose sports prac-
tice level is above the national average. Despite showing good PA knowledge in the general questionnaire, these medical students obtained a low correct response rate on the PA recommendations by the WHO. In general, PA knowledge was not related to PA practice. The results also show that physically active individuals perform PA during the week, which was evidenced by their shorter sitting time in this period. Even though there was no association between PA practice and PA knowledge, it can be said that personal practices may improve medical students’ capability to encourage and motivate their patients in the future.

CONFLICTS OF INTERESTS

None to declare.

REFERENCES

1. World Health Organization. Global status report on noncommunicable diseases 2014. 2014. [cited 2019 Aug 5]. Available from: https://www.who.int/nmh/publications/ncd-status-report-2014/en/

2. U.S. Department of Health and Human Services. 2008 Physical activity guidelines for Americans. 2008. [cited 2019 Aug 5]. Available from: https://health.gov/sites/default/files/2019-09/paguide.pdf

3. Haskell WL, Lee IM, Pate RR, Powell KE, Blair SN, Franklin BA, Macera CA, Heath GW, Thompson PD, Bauman A. Physical activity and public health: updated recommendation for adults from the American College of Sports Medicine and the American Heart Association. Circulation 2007;116(9):1081-93.

4. Jesus GM, Jesus ÉFA. Nível de atividade física e barreiras percebidas para a prática de atividades físicas entre policiais militares. Rev Bras Ciênc Esporte 2012;34(2):433-48.

5. Abdel-Khalek AM. Prevalence rates of reported nightmares in a cross-sectional sample of Kuwaiti children, adolescents, undergraduates, and employees. Sleep Hypn 2010;12(1-2):13-22.

6. Astrand PO, Rodahl K. Textbook of work physiology. McGraw-Hill; New York. 1986.

7. Rondon MUPB, Forjaz CLM, Nunes N, Amaral SL, Barretto ACP, Negrão CE. Comparações entre a pre-pressão de intensidade de treinamento físico baseada na avaliação ergométrica convencional e na ergoespirométrica. Arq Bras Cardiol 1998;70(3):159-66.

8. Lundby C, Montero D, Joyner M. Biology of VO2max: looking under the physiology lamp. Acta Physiol 2017; 220(2):218-28.

9. Pescatello LS, Arena R, Riebe D, Thompson PD. ACSM's guideline for exercise testing and prescription. J Can Chiropr Assoc 2014;58(3):328.

10. McKinney J, Lithwick DJ, Morrison BN, Nazzari H, Isserow SH, Heilbron B, Krahn AD. The health benefits of physical activity and cardiorespiratory fitness. B C Med J 2016;58(3):131-7.

11. Rao CR, Darshan B, Das N, Rajan V, Bhogun M, Gupta A. Practice of physical activity among future doctors: a cross sectional analysis. Int J Prev Med 2012; 3(5): 365-9.

12. Hallal PC, Victora CG. Reliability and validity of the international physical activity questionnaire (IPAQ). Med Sci Sports and Exerc 2004;36(3):556.

13. Pardini R, Matsudo S, Araújo T, Matsudo V, Andrade E, Braggion G, Andrade D, Oliveira L, Figueira A, Raso V. Validação do questionário internacional de nível de atividade física (IPAQ – versão 6): estudo piloto em adultos jovens brasileiros. Rev Bras Ciênc e Mov 2001; 9(3):45-51.

14. Dacey ML, Kennedy MA, Polak R, Phillips EM. Physical activity counseling in medical school education: a systematic review. Med Educ Online 2014;19:24325.

15. Lobelo F, Duperly J, Frank E. Physical activity habits of doctors and medical students influence their counseling practices. Br J Sports Med 2009;43(2):89-92.

16. Domingues MR, Araújo CLP, Gigante DP. Conhecimento e percepção sobre exercício físico em uma população adulta urbana do sul do Brasil. Cad Saude Publica 2004; 20(1):204-15.

17. IPAQ. Guidelines for data processing and analysis of the International Physical Activity Questionnaire (IPAQ): short and long forms. 2005. [cited 2019 Aug 10]. Available from: https://docs.google.com/viewer?a=v&pid=sites&srcid=ZGVmYXVsdGRvbWFpbnx0aGVpcGFxfGd4OjE0NDgxMDk3NDU1YWRlZTM

18. Cruz MAF, Guimarães MKH, Macena LB, Silva LNS, Cruz JF. Nível de atividade física e índice de massa corpórea em acadêmicos de medicina da Universidade Tiradentes em Aracajú-SE. Cad Grad Ciênc Biol Saúde 2015;3(1):101-122,

19. Wattanapisit A, Funghthongcharoen K, Saengow U, Vijitpongjinda S. Physical activity among medical students in Southern Thailand: a mixed methods study. BMJ Open 2016;6(1):e013479:1-7.

20. Scheffer MC, Cassenote AJF. A feminização da medicina no Brasil. Rev Bioet 2013;21(2):268-77.

21. Santos LIL, Moraes SR, Souza DN, Ellinger VCM, Silva CMS. Avaliação da prevalência de obesidade e sobrepeso entre estudantes de medicina da Universidade Severino Sombra, Vassouras-RJ. R Flu Exten Univ
22. Ministério da Saúde (Brasil). Vigitel Brasil 2018: vigilância de fatores de risco e proteção para doenças crônicas por inquérito telefônico: estimativas sobre frequência e distribuição sociodemográfica de fatores de risco e proteção para doenças crônicas nas capitais dos 26 estados brasileiros e no Distrito Federal em 2018. 2019 [citado em 2019 set 25]. Disponível em: https://portalarquivos2.saude.gov.br/images/pdf/2019/julho/25/vigitel-brasil-2018.pdf.

23. Padmapriya K, Krishna P, Rasu T. Prevalence and patterns of physical activity among medical students in Bangalore, India. *Electron Physician* 2013;5(1):606-10.

24. Bergier B, Tsos A, Bergier, J. Factors determining physical activity of Ukrainian students. *Ann Agric Environ Med* 2014;21(3):613-6.

25. Raddi LLO, Silva Júnior JP, Ferrari GLM, Oliveira LC, Matsudo VKR. Nível de atividade física e acúmulo de tempo sentado em estudantes de medicina. *Rev Bras Med Esporte* 2014;20(2):101-4.

26. Nardelli GG, Eliana Maria Gaudenci EM, Garcia BB, Carleto CT, Gontijo LM, Pedrosa LSK. Perfil dos alunos ingressantes dos cursos da área da saúde de uma universidade federal. *REAs* 2013;2(1):3-12.

27. Nóbrega ECM. História familiar de doenças crônicas, atividade física e hábitos alimentares em estudantes da área da saúde. *Rev Bras Pronto-Soc* 2014;27(3):333-40.

28. World Health Organization. Physical activity: key facts. 2018. [cited 2019 Sep 25]. Available from: https://www.who.int/news-room/fact-sheets/detail/physical-activity.

29. Mandic S, Wilson H, Clark-Grill M, O’Neill D. Medical Students’ Awareness of the Links between Physical Activity and Health. Monten. *J. Sports Sci Med* 2017; 6(2):5-12.

30. Dunlop M, Murray AD. Major limitations in knowledge of physical activity guidelines among UK medical students revealed: implications for the undergraduate medical curriculum. *Br J Sports Med* 2013;47:718-20.