

## RESEARCH ARTICLE

# Metabolic equivalent task assessment for physical activity in medical students

Pranita Ashok, Jayashree S Kharche, Robin Raju, Gayatri Godbole

Department of Physiology, Bharati Vidyapeeth Medical College, Pune, Maharashtra, India

Correspondence to: Pranita Ashok, E-mail: pranita76@gmail.com

Received: August 27, 2016; Accepted: September 04, 2016

### ABSTRACT

**Background:** The ability to assess energy expenditure (EE) and estimate physical activity (PA) in free-living individuals is extremely important in the global context of non-communicable diseases including malnutrition, overnutrition (obesity), and diabetes. Metabolic equivalent task (MET) is used as a means of expressing the intensity and EE of activities. **Aims and Objective:** To assess the PA as MET using the International PA Questionnaire (IPAQ). **Material and Methods:** It was a cross-sectional study conducted on 87 (29 males and 58 females) medical students aged between 18-25 years. Detailed history of PA was taken, so as to find out the type and quality of PA, they were engaged in. In IPAQ (short), questionnaire information was asked about three specific types of activity such as walking, moderate-intensity activities, and vigorous-intensity activities. MET was calculated. **Results:** It was found that as per MET score calculated from IPAQ, 40%, 47%, and 13% of students fall in low, moderate, and high PA groups, respectively. **Conclusion:** MET utilization provides a convenient method to describe the functional capacity or exercise tolerance of an individual. It was observed that PA was very low in medical students as calculated by MET.

**KEY WORDS:** Metabolic Equivalent Task; Physical Activity; Medical Students

### INTRODUCTION

The ability to assess energy expenditure (EE) and estimate physical activity (PA) in free-living individuals is extremely important in the global context of non-communicable diseases (NCD) including malnutrition, overnutrition (obesity), and diabetes. It is also important to appreciate that PA and EE are different constructs. PA is defined as any bodily movement that results in EE, and accordingly, energy is expended as a result of PA.<sup>[1]</sup>


As a result, there is growing prevalence of NCD which is affecting economy of many countries. Nearly 45% of

the adult disease burden is attributed by NCD such as coronary heart disease, type 2 diabetes, and psychological disorders.<sup>[2]</sup>

Physical inactivity and the associated health problems pose a current and growing threat to public health.<sup>[1]</sup> The World Health Organization (WHO) reports that approximately 60% of the global population do not meet the recommended daily minimum of PA.<sup>[3]</sup>

Physical inactivity has been identified as one of the leading preventable causes of death and inverse linear relationship exists between volume of PA, behavior, and mortality.<sup>[2]</sup> Regular exercise can reduce the risk of cardiovascular diseases, diabetes, colon and breast cancer, and depression. Regular exercise helps control body weight and also prevents osteoporosis and fractures.<sup>[1]</sup>

The WHO highlights that every activity that lasts more than 10 min is beneficial.<sup>[3]</sup> It is crucial for children to develop healthy habits as a high PA level in childhood and the

Access this article online	
Website: <a href="http://www.njppp.com">www.njppp.com</a>	Quick Response code 
DOI: 10.5455/njppp.2017.7.0825604092016	

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adolescent years increases the probability of a higher PA level in the future.

The International PA questionnaire (IPAQ) elaborated at the end of 1990s by a group of international consensus, which is increasingly used. Therefore, it is a valid instrument of measuring PA which allows the international comparisons and which studies PA in its totality (at work, at home, and in the context of transports and hobbies). In its short version, it presents the specificity of measuring PA relying on intensity rather than type.

The metabolic equivalent task (MET), or simply metabolic equivalent, is a physiological measure expressing the energy cost of PA and is defined as the ratio of metabolic rate (and therefore the rate of energy consumption) during a specific PA to a reference metabolic rate, set by convention to 3.5 ml O<sub>2</sub>·kg<sup>-1</sup>·min<sup>-1</sup> or equivalently.<sup>[4]</sup>

Due to improved transportation facilities and sedentary lifestyle, there is marked reduction in PA in young adults. All modern amenities in the future are likely to increase risk for obesity and related diseases in the future such as diabetes and hypertension.<sup>[5]</sup>

MET is used as a means of expressing the intensity and EE of activities in a way comparable among persons of different weight. Actual EE (e.g., in calories or joules) during an activity depends on the person's body mass; therefore, the energy cost of the same activity will be different for persons of different weight.

Recent epidemiologic evidence suggests that sitting for long time may be a cardiovascular and metabolic risk factor independent of physical inactivity. According to displacement hypotheses, spending time in sedentary activities reduces the time, which can be spent, participating in PA.

The stress involved in meeting responsibilities of becoming a physician may adversely affect the exercise habits of students. Hence, the current study aimed to study the practice of PA among undergraduate medical students. PA as a behavior and cardiorespiratory fitness as a state represent major determinants of public health, specific measurements of health determinants must be understood to enable a truthful evaluation of the interactions and their independent role as a health predictor.

Healthy habits among medical students are even more important as they are future physicians, and the students who personally ignore adopting healthy lifestyle are more likely to fail to establish health promotion opportunities for their patients. Furthermore, medical students have been shown to exhibit early risk factors for chronic diseases. Hence, this

study is planned to find out PA status in terms of MET, in young adults using subjective questionnaire, i.e., IPAQ.

## MATERIALS AND METHODS

This study was conducted on the medical students studying MBBS course in a medical college. It was a cross-sectional study. The Institutional Ethics Committee approval was obtained. 87 (29 males and 58 females) medical students aged between 18 and 25 years took part in the study.

Detailed history of PA was taken using the IPAQ,<sup>[6]</sup> so as to find out the type and quality of PA, they were engaged in. In IPAQ (short), questionnaire information is asked about three specific types of activity such as walking, moderate-intensity activities, and vigorous-intensity activities. MET is calculated by IPAQ evaluation which is one of the easiest methods for recording of the intensity of a PA.

MET was calculated by IPAQ evaluation as follows:

MET values and formula for computation of MET-minutes/week

1. Walking MET-minutes/week = ×3.3 walking minutes × walking days
2. Moderate MET-minutes/week = ×4.0 moderate-intensity activity minutes × moderate days
3. Vigorous MET-minutes/week = ×8.0 vigorous-intensity activity minutes × vigorous-intensity days
4. Total PA MET-minutes/week = sum of walking + moderate + vigorous MET-minutes/week scores.

After calculation of the total MET score, the participants were divided into various categories as follows:

Categorical score for MET:

- Category and score: MET-minutes/week
- Category 1 (low): <600 MET-minutes/week
- Category 2 (moderate): ≥600 to <3000 MET-minutes/week
- Category 3 (high): ≥3000 MET-minutes/week.

## RESULTS

Findings of this study were recorded in Table 1.

**Table 1:** Categorical score-wise distribution of students for physical activity in study population

Categorical score	MET-minutes/week	Number of participants (%)
Category 1 (Low)	Not meet category 2 and 3	35 (40)
Category 2 (Moderate)	≥600 MET-minutes/week	41 (47)
Category 3 (High)	≥3000 MET-minutes/week	11 (13)
Total participants		87 (100)

MET: Metabolic equivalent task

## DISCUSSION

Table 1 shows that as per MET score calculated from IPAQ, 40%, 47%, and 13% of students fall in low, moderate, and high PA groups, respectively.

Similar results were observed by a study by Anand *et al.*<sup>[7]</sup> in which they found the attitude of the participants toward the PA was favorable, yet only one-third (32.3%) of participants adhered to the recommended guidelines. The 2008 PA guidelines for adults<sup>[8]</sup> say that for additional and more extensive health benefits, adults should increase their aerobic PA to 300 min (5 h) a week of moderate intensity, or 150 min a week of the vigorous-intensity aerobic PA, or an equivalent combination of the moderate- and vigorous-intensity activity.

Several authors<sup>[7-12]</sup> have observed a positive relationship between physical fitness and students' academic results. It is presumed that medical students have substantial knowledge about PA and its benefits, and as health-care professionals, they will have an influence on their patients' attitude toward PA and an ethical obligation to prescribe suitable exercises. Ángyán *et al.*<sup>[13]</sup> reported that medical students had low physical activity levels as a result of high workload and less free time.

In our study, most of the participants did not reach the recommended levels of PA. Regular exercise is an essential part of a healthy lifestyle; therefore, all medical professionals should maintain the recommended physical activity level to remain healthy and look credible in the eyes of their patients. It is assumed that medical staff should be physically active to be credible while promoting exercise among their patients and that physical therapists are well prepared and qualified to promote PA although their role often is underestimated by other health-care professionals.<sup>[13,14]</sup> It is well known that there is a direct correlation between PA level in medical students and medical advice they give to patients. The level of PA among students as a predictor of health promotion was evaluated based on a review of the literature.<sup>[15,16]</sup>

It was found that the majority of students undertake PA only as part of their physical education module, which means that future physicians may not apply their substantial knowledge of the benefits of PA in their everyday lives. Therefore, our results are consistent with the findings of other researchers who have reported that medical students do not meet the recommended level of PA.

It has been reported that intention to exercise and awareness of the benefits of exercise are weakly related to participation in PA. Probably motivation, supportive environment, and available facilities are more important factors to participate in PA. It was conducted on one-semester students so may not reflect entire population of students.

Today's medical student is a future physician. Medical student should be motivated for PA. Adequate infrastructure should be provided by the institute. Health education and proper training sessions should be arranged for them which may help improve their physical fitness. These measures may help them against the future risks of obesity, diabetes, and hypertension.

1. A number of limitations affect the utility of METs as a method of describing exercise intensity and estimating the EE of PA. A larger person would be expected to have a larger resting oxygen uptake compared with a smaller person. Activities involving high levels of skill, such as swimming, cross-country skiing, squash, and tennis, are particularly subject to a wide range of EE. The published energy cost of activities is also significantly affected by various environmental conditions, including cold, heat, humidity, wind, altitude, playing surface, and terrain, as well as clothing and equipment worn. Even with these limitations, the MET concept represents a simple, practical, and easily understood procedure for expressing the energy cost of PA as a multiple of the resting metabolic rate.

## CONCLUSION

MET utilization provides a convenient method to describe the functional capacity or exercise tolerance of an individual. It was observed that PA was very low in medical students as calculated MET.

## REFERENCES

1. Caspersen CJ, Powell KE, Christenson GM. Physical activity, exercise, and physical fitness: Definitions and distinctions for health-related research. *Public Health Rep.* 1985;100(2):126-31.
2. Marcus BH, Williams DM, Dubbert PM, Sallis JF, King AC, Yancey AK, *et al.* Physical activity intervention studies: What we know and what we need to know: A scientific statement from the American Heart Association Council on Nutrition, physical activity, and metabolism (subcommittee on physical activity); Council on cardiovascular disease in the young; And the interdisciplinary working group on quality of care and outcomes research. *Circulation.* 2006;114(24):2739-52.
3. World Health Organization. Myths about Physical Activity. Available from: [http://www.who.int/dietphysicalactivity/factsheet\\_myths/en/index.html](http://www.who.int/dietphysicalactivity/factsheet_myths/en/index.html). [Last accessed on 2010 Sep 13].
4. Ekelund U, Sepp H, Brage S, Becker W, Jakes R, Hennings M, *et al.* Criterion-related validity of the last 7-day, short form of the international physical activity questionnaire in Swedish adults. *Public Health Nutr.* 2006;9(2):258-65.
5. Guidelines for Data Processing and Analysis of the International Physical Activity Questionnaire (IPAQ). Available from: <http://www.ipaq.ki.se/scoring.pdf>.
6. Han TS, Sattar N, Lean M. ABC of obesity. Assessment of obesity

- and its clinical implications. *BMJ*. 2006;333(7570):695-8.
7. Anand T, Tanwar S, Kumar R, Meena GS, Ingle GK. Knowledge, attitude, and level of physical activity among medical undergraduate students in Delhi. *Indian J Med Sci*. 2011;65(4):133-42.
  8. American College of Sports Medicine. Guidelines for Graded Exercise Testing and Exercise Prescription. 2<sup>nd</sup> ed. Philadelphia, PA: Lea & Febiger; 1980.
  9. Shephard RJ. Habitual physical activity and academic performance. *Nutr Rev*. 1996;54:S32-6.
  10. Castelli DM, Hillman CH, Buck SM, Erwin HE. Physical fitness and academic achievement in third - And fifth-grade students. *J Sport Exerc Psychol*. 2007;29(2):239-52.
  11. Chomitz VR, Slining MM, McGowan RJ, Mitchell SE, Dawson GF, Hacker KA. Is there a relationship between physical fitness and academic achievement? Positive results from public school children in the Northeastern United States. *J Sch Health*. 2009;79(1):30-7.
  12. Basch CE. Physical activity and the achievement gap among urban minority youth. *J Sch Health*. 2011;81(10):626-34.
  13. Ángyán L. Launching kinesiology in medical education. *Med Educ*. 2000;5:8. Available from: <http://www.med-ed-online.org>.
  14. Ángyán L, Fark G, Rugási E. Trends in prevention-oriented physical education. *ICSSPE Bull*. 2002;36:10-1.
  15. Ángyán L, Térczely T, Mezey B, Lelovics Z. Selected physical characteristics of medical students. *Med Educ*. 2003;8:1-6.
  16. 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.

**How to cite this article:** Ashok P, Kharche JS, Raju R, Godbole G. Metabolic equivalent task assessment for physical activity in medical students. *Natl J Physiol Pharm Pharmacol* 2017;7(3):236-239.

**Source of Support:** Nil, **Conflict of Interest:** None declared.