Original Research Article

Assessment of physical activity and sedentary behaviour in bachelors of computer science students using global physical activity questionnaire version 2: a cross-sectional study

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ABSTRACT

Background: Physical activity has been determined as primary prevention strategy against 35 chronic conditions. Lack of physical activity, improper diet and increase in the use of computer has various health hazards. Considering that the bachelor of computer science students will mostly have sedentary work profile, once they enter the professional world, the objective of the present study was to assess their physical activity level using global physical activity questionnaire (GPAQ) version 2.
Methods: A cross sectional study was conducted on 355 participants, 244 males and 111 females, from an institution catering bachelors of computer science course using GPAQ questionnaire. The data was analyzed to see if they meet the criteria set by World Health organization (WHO) and were classified into categories on basis of MET minute/week. The average time spent in sitting position was also calculated.
Results: At work, 19.15% study participants were moderately active; in travel domain 64.5% were active, in leisure domain 43.94% were vigorously while 41.4% were moderately active. 73.23% of study participants met the WHO set criteria. 26.76% participants were inactive, 62.53% low active, 10.14% moderate active while only 0.81% was highly active. Average time spent in sitting was around 9 hours.
Conclusions: Even though 73.23% of study participants met the criteria, most of the participants had low level of physical activity, thus there is huge scope for improvement in it. They also need to be educated regarding the risks of sedentary behaviour which will further help to reduce the hazards related to physical inactivity.

Keywords: Bachelors of computer science students, Physical activity level, Sedentary behaviour, GPAQ

INTRODUCTION

Non-communicable diseases (NCDs), also known as chronic diseases are the result of a combination of genetic, physiological, environmental and behavioral factors. Non-communicable diseases (NCDs) includes cardiovascular diseases; chronic respiratory diseases, cancer, and diabetes mellitus.[1] They are the leading cause of death globally. NCDs account for 41 million 71%

deaths globally out of which cardiovascular diseases (CVD) account for most of the deaths i.e. 17.9 million annually.[1] 80% of total deaths due to cardiovascular diseases occur in low and middle-income countries.[2] The risk factors associated with NCD can be categorized as modifiable and non-modifiable. Non-modifiable risk factors include age, gender, race, and genetics. These cannot be reduced or controlled by interventions.

Modifiable risk factors include physical inactivity, unhealthy diet, tobacco use, harmful use of alcohol, etc.[3]

Physical activity is defined as any bodily movement produced by the contraction of skeletal muscles that result in a substantial increase in caloric requirements over resting energy expenditure.[4] Studies have shown that physically active people are at a lesser risk of developing coronary heart disease compared to physically inactive people.[5] Physical activity has been determined as primary prevention strategy against 35 chronic conditions including sarcopenia, metabolic syndrome, peripheral artery disease, congestive heart failure, deep vein thrombosis, cognitive dysfunction, polycystic ovary syndrome and so on.[6] People who are physically active have improved musculoskeletal function, improved cardio-respiratory fitness, have lower rates of coronary heart disease, high blood pressure, stroke, diabetes mellitus, cancer and depression; there is decrease in the risk of falls and are more likely to maintain their body weight.[7]

Physical inactivity causes a lot of hazards like overweight and obesity, decrease in muscle strength and endurance, decrease in bone quality, difficulty in lipid and carbohydrate metabolism, affection of immune system, poor blood circulation and hormonal imbalance.[8] According to World Health Organization (WHO), 1.6 million deaths are caused by physical inactivity.[1] Globally, 23% adults and 81% school going children are inactive.[7] Physical inactivity has increased with the increase in use of computers. Lack of physical activity, improper diet and increase in the use of computer are leading cause of obesity, especially central obesity.[9] According to INTERHEART study, the risk of myocardial infarction increases with abdominal obesity and other factors like smoking, hypertension, diabetes etc.[10] Obesity is associated with its own paradigm of complications and co morbidities. Increased use of computers has led to increased adiposity in children.[11] India is the third largest country after USA and China to have highest number of obese people.[12]

It takes more than decades for chronic diseases to be completely established.[13] The risk factors of today will surely develop into diseases of tomorrow. Therefore, if proper measures are taken and lifestyle modifications are made, the risk for NCDs can be reduced. People should be regularly involved in moderate intensity physical activity, avoid unhealthy weight gain and follow healthy diet in order to prevent cardiovascular diseases and reduce premature mortality.[14] According to World Health Organization, if people do not start giving importance to physical activity, then by 2025 the target of achieving 10 percent reduction in insufficient physical activity cannot be met.[15]

The world now heavily relies on technology. People are becoming physically inactive and adapting sedentary lifestyle. Sedentary behavior is defined as any waking behavior characterized by the expenditure of 1.5 METs or less of energy while in a sitting, reclining, or lying posture.[16] Metabolic equivalent (MET) value for sedentary behavior is ≥ 1 to ≤ 1.5.[17] In leisure time people usually perform sedentary activities like watching television, playing video games, spending time on mobile phones and computers. Nowadays, most of the work scenarios involve sitting for a minimum of 7-8 hours per day. Sedentary behavior increases the risk of diabetes and all-cause mortality.[18]

In order to indulge in a proper physical activity program, baseline evaluation or assessment of physical activity level is essential. GPAQ was developed by World Health Organization (WHO).[19] This was developed to reduce inter-country and within country variations in the evaluation of physical activity. It is a suitable and acceptable instrument to measure the physical activity.[20] It evaluates physical activity in three domains of work related, travel related and leisure time related. Physical activity is also assessed in regards to moderate and vigorous intensities. This questionnaire also gives information regarding the amount of time spent sitting. Reliability coefficients (Kappa 0.67 to 0.73; Spearman's rho 0.67 to 0.81) were of moderate to substantial strength while results on concurrent validity between IPAQ and GPAQ showed a moderate to strong positive relationship (range 0.45 to 0.65).[20] Validity has also been shown to be moderate for moderate and vigorous intensity physical activity while poor for sedentary behavior.[21]

If baseline physical activity level is established proper exercise programs can be designed to target and meet desired physical activity level in terms of MET-minutes. Every activity has a set MET value depending on the energy requirement of that activity. MET-minutes can be calculated from the product of MET value of the activity and the amount of time, a person spends in performing that activity. It is therefore essential to first assess the level of physical activity and increase awareness about physical inactivity and its hazards.

Considering that the bachelor of computer science students will join companies where, they will mostly have sedentary work profile, involving working on computers for 8-10 long hours, this study was designed to assess their physical activity level and sedentary behavior using global physical activity questionnaire (GPAQ) version 2. Many studies have been done to evaluate physical activity in different age groups and at different work settings. But there is dearth of literature of this evaluation in students who will pursue a career that will have long working hours and highly predispose them to sedentary behavior and lower physical activity.

Primary objective of this study was to determine the level of physical activity and sedentary behavior in the bachelors of computer science students, using GPAQ version 2. Secondary objective was to categorize the participants on the basis of MET minute/week criteria and

assess if they met the minimum physical activity criteria set by World Health Organization.

METHODS

This study was a cross sectional study, with institution being the study setting. This study was carried out at Deccan Education Society's, Department of Computer Science, Fergusson College Campus, Pune. This institution was selected on basis of convenience. Institutional ethics committee clearance was sought. Permission was taken from the concerned authority to perform study on their students. The data collection process was carried out from 26th August 2019 to 26th January 2020. All the students enrolled for the course, at that time, were a part of inclusion criteria. Exclusion criteria included students who refused to give consent to participate in the study. Complete list of all these students was obtained from the authority. Several attempts were made to approach each student individually, with utmost care taken so as to not disturb their teaching schedule. Participants were given subject information sheet and informed consent was taken.

Questionnaire was administered on an interview basis. The questionnaire has three domains: activity at work, travel to and from places and recreational activities. It assesses the moderate and vigorous physical activity in all these domains. Every domain has been assigned specific MET value and depending on the number of minutes that the participant spends in doing an activity, MET-minutes are calculated for each domain. MET value for moderate intensity activity is 4 METs while for vigorous intensity is 8 METs.[19] The participants were further explained about different activities that fall under moderate and vigorous intensity activities with the help of show cards. Some of the examples of moderate intensity activities are brisk walking, cycling, swimming, etc. and vigorous intensity activities are spinning, high impact aerobics, football, etc. Their response in each domain of physical activity, viz. work, transport, leisure was noted. Total MET - minutes was then calculated by the product of MET value of the respective activities and time spent (in minutes) in doing those activities. The study participants were also categorized as inactive (<600 MET minute/week), low active (600-3999 MET minute/week), moderately active (4000-7999 MET minute/week) and highly active (>8000 MET minute/week) based on MET-minutes of physical activity per week.[22]
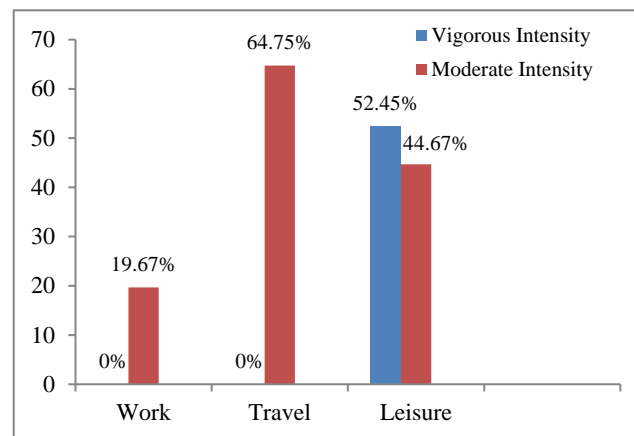
The data was then used to analyze if they met the physical activity criteria set by WHO which is 150 minutes of moderate intensity physical activity or 75 minutes of vigorous intensity physical activity or a combination of both moderate and vigorous intensity at least for 600 MET minutes per week.[19] The study participants were also asked about the average amount of time spent sitting in a day which would give idea about their sedentary behavior.
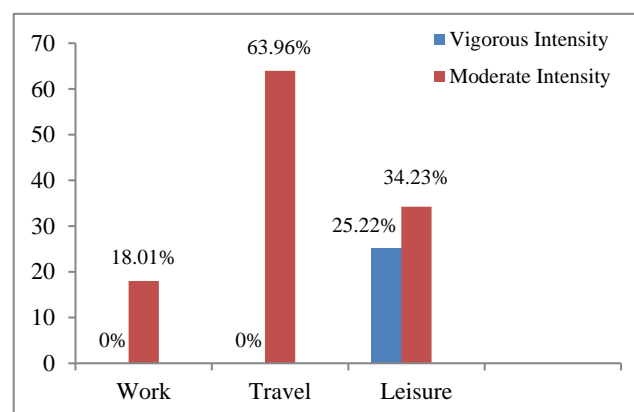
Statistical analysis

Statistical analysis was done using guidelines given in GPAQ analysis guide in terms of analyzing physical activity data. This was done using excel office version 2019. Continuous variables expressed in terms of mean±SD (standard deviation). Categorical variables expressed in terms of frequencies and percentage.

RESULTS

The complete list of students, obtained from the concerned authority of selected institution included 516 students, of which 355 students participated in study. Response rate was 68.79%. Repeated attempts were made to approach the remaining students but due to time and resource constraints they could not be included in the study. All the study participants belonged to the age group of 17-21 years. 244 (69%) of the study participants were males and 111 (31%) of the participants were females.

Figure 1: Domain wise physical activity of male participants (n=244).
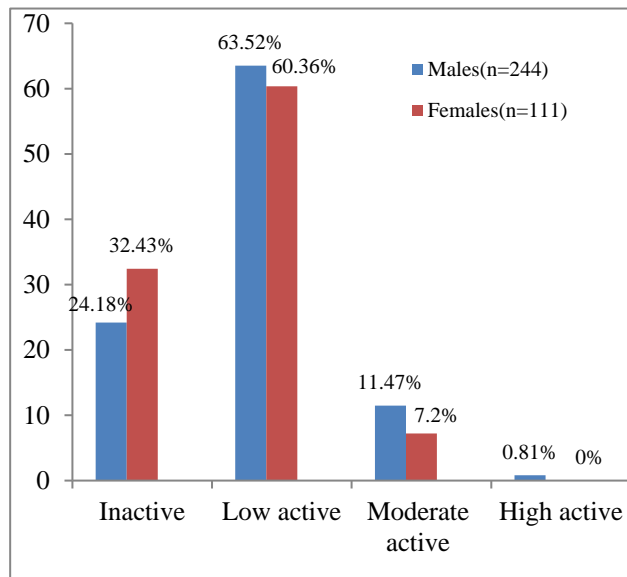

Figure 2: Domain wise physical activity of female participants (n=111).

The distribution of physical activity in terms of the three domains included in the questionnaire, i.e. work, travel

and leisure time related are demonstrated in (Figure 1) for the male participants and in (Figure 2) for the female study participants.

185 (76%) of the male participants and 75 (68%) of the female participants met the physical activity criteria set by WHO.[19] Based on their participation in various physical activities (in terms of MET minute) on a weekly basis, the study participants were categorized in four groups; inactive, low active, moderately active and highly active.[22] Figure 3 displays information regarding the same.

Figure 3: Distribution of physical activity of study participants in categories based on MET minute/week.

In sedentary behaviour domain, the average amount of time spent sitting was 9.32 ± 1.64 hours in male participants and was 9.49 ± 2.23 hours in female participants.

DISCUSSION

The purpose of the study was to evaluate the level of physical activity in bachelor of computer science students using global physical activity questionnaire (GPAQ) - version 2 developed by World Health Organization (WHO). In our study physical activity of the participants was calculated in terms of moderate and vigorous intensity in three domains work, travel to and from places and leisure time. At work, the study participants were inactive for vigorous intensity and minority 19.15% was active for moderate intensity, which involved brisk walking between two lecture rooms spaced out in the campus. 64.5% of the study participants were found to be active in the travel domain. Majority of them used walking as a mode of transport. In leisure time participants were more vigorously active 43.94% and were involved in activities like football, zumba, spinning while moderately active 41.2% participants were involved in activities like brisk walking, pilates, badminton.

The study participants were further divided into inactive, low active, moderately active and highly active on the basis of MET minutes.[22] In all the four categories males were more active than females. We found that 26.76% were inactive, maximum 62.53% of the study participants belonged to low physical activity, 10.14% were moderately active and only 0.81% was highly active. Majority of the population did not score well in the work-related domain but it was all well compensated in the transport and leisure domain, thereby helping them to meet the set criteria.

Many studies have been done in adolescents and adults who have shown mixed results about physical activities of moderate and vigorous intensity in various domains.[23-27] Results from majority of these studies have shown inadequate physical activity amongst study participants and majority of the participants falling under low physical activity level.

In our study 73.23% of the study participants met the criteria set by WHO. 75.81% of males and 67.56% of females met the criteria set by WHO which is 150 minutes of moderate intensity physical activity or 75 minutes of vigorous intensity physical activity or a combination of both moderate and vigorous intensity for at least 600 MET minute per week. These results also hint at the need for more gender-oriented designing of the activities or programs in order to improve the physical activity participation and activity levels of the female population.

Even though good number of study participants met the physical activity criteria set by WHO, majority of the study participants fell under the category of inactive and low-active. Also, only 11.47% of male participants and 7.2% of female participants fell under the category of moderately active whereas only 0.81% of males qualified for the highly active category. Thus, even if good number of study participants have met the physical activity criteria there is huge scope to improve their physical activity levels from inactive or low active to moderate or high- active category.

Study participants being students, can devote set amount of time for physical activity especially in recreational domain, and that could be a possible reason for majority of the study participants meeting the set criteria by WHO. Considering their age group, if properly educated about the hazards of physical inactivity or inadequate physical activity, and also made aware about the various domains and intensities that can be used to meet the target of required physical activity, they can still incorporate or make major lifestyle changes which will help them to cope with the upcoming stress that they will face once they start working as professionals.

'Sedentary behavior is defined as time spent sitting or lying with low energy expenditure, while awake, in the context of occupational, educational, home and community settings and transportation' as given by WHO. It has also been stated that there is high quality evidence for a significant relationship between greater time spent in sedentary behavior and higher all-cause mortality, cardiovascular mortality, cardiovascular disease incidence and type 2 diabetes incidence.[28] In our study we found that the average amount of time (in hours) spent in sitting was 9.49±2.23, thus there is definitely scope to reduce the number of hours of sedentary behavior, and if that cannot be reduced because of the academic schedule, efforts need to be made in order to improve the physical activity level in various domains and compensate for the sedentary behavior.

NCDs develop over a long period of time; therefore, there are multiple opportunities at which interventions can be done to alter the progression of disease. Obese and overweight individuals can lower their risk of developing cardiovascular diseases by working on their physical activity.[29] People should start with regular exercise, indulge in regular physical activities like walking, jogging, cycling, etc., engage in some form of physical activities or sports of their interest in their leisure time, follow proper diet, decrease the use of computers and decrease their sedentary behavior in order to target and reduce the modifiable risk factors of NCDs.

Physical activity criteria's have been set by different organizations. According to WHO people in the age group of 5-17 years should perform at least 60 minutes of moderate to vigorous intensity activity per day; adults aged between 18-64 years should perform 150 minutes of moderate intensity physical activity each week or 75 minutes of vigorous intensity physical activity each week or a combination of moderate and vigorous intensity activity each week.[7]

According to American College of Sports Medicine (ACSM) and American Heart Association (AHA) recommendations, adults aged 18-65 years should perform moderate intensity aerobic physical activity for 30 minutes on 5 days per week or vigorous intensity aerobic activity for minimum of 20 minutes on 3 days per week or combination of moderate and vigorous intensity activity.[30] Every adult should perform activities that maintain or increase muscular strength and endurance for a minimum of 2 days per week.[4]

Hence, the data or results from this study will help in designing and implementing specific domain and intensity-based strategies. This will help in making the college campus more equipped with facilities and opportunities that will demand and improve physical activity levels of these study participants and the goal of maximizing the physical activity level can be achieved. This in turn will help to reduce the varied hazards of physical inactivity.

Strengths

The questionnaire, global physical activity questionnaire (GPAQ - version 2) used in our study is also a part of World Health Organization STEPS instrument which has been used extensively to screen the NCDs risk factors in different settings and strata of population. Also, because our study has stratified the physical activity in regards to domain and intensity, specific strategies can be implemented to improve physical activity level in every possible way.

Limitation

Due to time and resource constraints, random selection of participants from different institutes catering bachelors of computer science course could not be done.

Future scope of the study would be to compare physical activity with anthropometric measurements like body mass index (BMI), waist hip ratio (WHR) and waist circumference.

CONCLUSION

This study concluded that even though good number of study participants met the physical activity criteria set by World Health Organization, substantial number of study participants belonged to the low physical activity level category which needs to be addressed sooner in order to avert the hazards of physical inactivity. Sedentary behavior seen in these study participants also needs to be altered; they need to be educated about its hazardous effects. The results of this study will surely help in implementing target specific strategies for the improvement in physical activity level.

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