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ORIGINAL RESEARCH

Physical Inactivity as a Pandemic: Daily Activities and Dietary Practices

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Background: Numerous studies have linked a decline in physical activity (PA) around the world to an increase in chronic diseases. There were two key goals for this study. The first was to observe how daily activities affected physical health in terms of VO_2max. The second aim was to investigate the effect of university students' dietary practices on levels of PA.

Methods: A repeated cross-sectional study was conducted on 75 subjects (41 males and 34 females) with an average age of 27.3 [SD 5.8] years. The respondents' physical activity in the previous seven days was classified as vigorous activity, moderate activity, walking, and sitting using the International Physical Activity Questionnaire (IPAQ). Anthropometric measurements such as height, weight, and body mass index (BMI) were reported at the baseline, during Lent (week 7 of the vegan diet), and seven weeks later (week 14). To determine Maximum Oxygen Consumption-the VO2max, the Queen's College Step Test [QCST] was used.

Results: There was a major difference in mean VO2max between males and females, with males getting a higher VO2max. There was no connection between VO2max and changes in dietary adherence/transition. Based on physical activity study, there were no major variations between subjects (walking Metabolic Equivalent Task (MET) and moderate MET). However, a thorough Vigorous MET showed major gender gaps. The majority of the participants in the current study spent 35 (46.7%) of their time studying and 19 (28%) of their time attending class lectures, with some students using more time than others.

Conclusion: Researches that may conduct in university and/or college students may provide early information to help the students understand their physical fitness. According to the findings of this limited prospective study, students spend the majority of their time engaging in sitting for various purposes. In turn, regardless of whether they followed a vegan or omnivorous diet, these study participants had low VO2 max.

Keywords: VO2max, gender, physical activity, diet, BMI, university

Introduction

The World Health Organization (WHO) is concerned about the rise of people who lead sedentary and inactive lives.[1] It is well known that college space offers opening for the consolidation of personality and behaviors, and that college enrollment creates new relationships and opportunities for sedentary activity.[2] Studies from Asian and American, as well as developing and developed countries[3,4] have reported the lowest levels of physical activity participation. Similarly, it was estimated that 40–50% of college students were inactive.[5]

Any physical activity that involves energy consumption, such as skeletal muscle movement, can enhance physiological and psychosocial functioning.[6] In comparison to any other waking action marked by low metabolic energy use and prolonged

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sitting or leaning back pose at work or school has the potential to contrarily affect human metabolism, physical work, and health outcomes. A study indicated that about 23% of adults and 8% of teenagers do not follow the "WHO global guidelines on physical activity for health.".[1]

Understanding why young people do not engage in physical activity and engage in sedentary behavior is crucial for intervention initiatives aimed at encouraging them to live more active lives. According to Swinburn et al,[7] people interact in several settings (eg, schools, workplaces, homes, restaurants), which are impacted by macro-environments (eg, government, society's attitudes and beliefs).

On the other hand, physical inactivity is not the only aspect attributed for hurting the maintenance of good physical and mental health in general; dietary also plays a part. Unfavorable cardio metabolic risk variables (eg, blood pressure, blood glucose, insulin levels, and lipid profile) have indeed been connected to dietary patterns in adolescents.[8]

Most existing research on the relationship between physical activity and dietary behavior only look at a small age range of children and do not indicate how different levels of physical activity affect dietary patterns.

As a result, this study was carried out to assess the diet, physical activity, and health status of college students, emphasizing that it is during this period that one's personality and behaviors are formed, and university enrollment brings new relationships and opportunities for sedentary behavior. To my knowledge, this is the first study of its kind that aimed to link daily physical activity with daily eating habits.

Methods

Subjects and Eligibility Criteria

A total of 41 male and 34 female volunteer medical and postgraduate students, with an average age of 27.3 [SD 5.8] years, participated in this study. All participants had to be between the ages of 18 and 35 and were also advised to: (1) cut out all animal-derived foods (meat, dairy products, eggs, and poultry) and fish from their daily diets during Lent; and (2) keep their normal lifestyle habits. Subjects, who smoked, were pregnant, had elevated blood pressure or chronic conditions, were on medication, or were members of any organized sports team were excluded.

Procedures and Measures

A cross-sectional design with repeated measurements was used in this analysis. Each subject detailed to the research facility three times. At the start, during Lent (week 7 of the vegan diet), and seven weeks later (week 14 during the omnivorous diet). During these times, both anthropometric measurements and dietary assessments were taken, as well as the completion of questionnaires on physical activity and fasting, health behaviors, and some personal details.

Physical Activity Patterns

All subjects had their stature and weight measured utilizing standard strategies.[9] Body mass index (BMI) was collated based on these measurements by using the equation: weight ((kg)/height^2 (m)). The PA level was assessed utilizing the IPAQ in which participants were asked to indicate the number of days and duration of specific PA per week. The ultimate form of questionnaires applied after translated from English into Amharic and then back into English. The metabolic equivalent task (MET) - minutes/week was used to indicate all scores obtained from IPAQ.

- Walking activity (W) = 3.3 x walking minutes/week;
- Moderate PA (M) = 4.0 x walking minutes/week;
- Vigorous PA (V) = 8.0 x walking minutes/week;
- Total PA = sum of minutes/week of W + M + V scores.

Furthermore, a physical activity readiness questionnaire was used following American College of Sports Medicine rules to ensure the safety of participants.[10]

Exercise Test for Determin

To determine VO2max, theQCST] method was used. As a pre-test measure, the resting pulse rate from the right carotid artery was recorded. Each subject was asked to perform the test one hour before the start of the test so that they all understood the procedure and became accustomed to the beeps. The subject was then asked to move up and down on the stool according to a pre-set metronome at a rate of 22 and 24 steps per minute, respectively, for females and males, for 3 minutes. Movement was based on beeps; on the first beep, the dominant leg ascends, on the second beep, the other leg ascends, on the third beep, the dominant leg descends, and on the fourth beep, the dominant leg descends. That is up-up-down-down. After the completion of the test right carotid pulses for 15 seconds from 5th __20th seconds soon after performance of step test as per the QCST protocol which end after three minute was taken. Then measurement obtained from 5th seconds of recovery pulse rate was then multiplied to 4 to get recovery heart rate (RHR) in beats

per minute. The value obtained was then incorporated to predict maximum oxygen uptake capacity in Mc Ardle.[11]

For Males: VO2max = 111.33-[0.42 RHR beats/min] = ___ O_2 mL/Kg^{-}min^{-1}

For females: VO2 max = 65.81-[0.1847xRHR beats/min] = ___ O_2 mL/Kg^{-}min^{-1}

VO2max is communicated in mL/kg/min, which normalizes the information for body weight and permits VO2max estimations to be compared between individuals of different body sizes. Since HR is used to estimate VO2max, questions about medications, caffeine, eating, nicotine, and other factors that influence HR were asked as a precaution before taking the phase test. This is because caffeine appears to underestimate VO2max as HR rises, whereas nicotine tends to overestimate VO2max as HR decreases.

Precautions Before Participation

The following precautions were taken to minimize certain physiological factors that alter heart rate (HR).

- Do not take heavy foods for about 3 hours before participating.
- Be advised not to take any kind of medication for 24 hours before participating in the step test.
- Do not take any coffee or tea on the days once you are taking an interest to participate.
- Take enough water and avoid alcohol consumption for 24 hours before the step test.
- Take time to rest well for 24 hours before participating.
- Be advised to inform any usual feeling during, before or after this study.

Dietary Intakes

To assess dietary intake, self-administered food frequency questionnaire (FFQ) which was adapted to characterize Ethiopian dietary practice was used. The final form of the FFQ was applied after translated from English into Amharic and then back into English for its consistence. The modified questionnaire was tested for approval and adjustments in 7 subjects who were not the study participants. Bread, cereals, potatoes, vegetables, pulses, fruit, eggs, cheese, milk and yogurt, fats, pastries, alcohol, meat, and fish were the food categories. In terms of cigarette smoking, the Global Adult Tobacco Survey (GATS) was used to determine respondents' smoking habits.

Statistics Analysis

Variables for physiological characteristics of study subjects were presented as mean ± SD. Independent samples *t*-test was used to compare physical activity between genders. The paired *t*-test was used to compare physical activity at baseline and after-transition to the vegan diet. Repeated measures ANOVA and Bonferroni post hoc test were used to determine differences in some anthropometric measurements throughout the study periods. P-values of less than 0.05 were statistically significant. The statistical analysis was performed by the SPSS 21.0; IBM, Armonk for Windows.

Results

Anthropometric Measurements

Seventy-five subjects (41 males and 34 females) were enrolled, all of whom were greater than the age of 18 (mean age 27.3 [SD 5.8]). Study participants completed the test without any troubles or clinical anomalies and their physiological characteristics were shown in Table 1.

Physical Activity

The difference in mean VO2max between males and females was significant, with males having a higher VO_2 max. VO2max values have no association with changes in dietary adherence/transition Table 1.

There were no significant differences between subjects based on physical activity analysis (walking MET and moderate MET). But, Vigorous MET revealed significant differences between genders Table 2.

Males and females at the university participated in different types of physical activity on a daily basis. Walking was the most common physical activity among both males and females (57.3%), with dancing being especially popular among females Figure 1.

The majority of the participants in the current study spent 35 (46.7%) of their time studying and 19 (28) of their time attending class lectures, with some students using more time than others. Females spent more time on watching TV shows or playing video games (14.7%) and sleeping (17.6%) than male counterparts Figure 2.

Discussion

To my knowledge, this is the first study of its kind that aimed to link the various types of students physical activities engaged in regular basis with daily eating habits.

The aim of the study was to look at the extent of daily living activities that universtiy students engage in and also

Table 1 Compares Variations in Selected Physiological Variables According to Gender and Dietary Pattern. (n = 75)

Variables	Male (n=41)			Female (n=34)			P1	P2
	Baseline	During	After	Baseline	During	After		
	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)		
Age (years)	27.3 (5.8)	–	–	25.21 (3.13)	–	–	–	–
Height (m)	1.71 (0.8)	–	–	1.64 (0.72)	–	–	–	–
Weight (kg)	70.5 (8.6)	66.7 (8.9)	68.1 (8.7)	68.9 (8.4)	65.2 (8.9)	66.3 (8.9)	0.061	0.02
BMI (kg/m2)	27.1 (3.4)	25.8 (3.4)	26.7 (3.5)	27.2 (5.5)	27.0 (5.7)	27.2 (5.5)	0.35	0.012
SBP (mmHg)	112.8 (10.8)	109 (11.9)	110 (10.1)	100.3 (13.1)	117.1 (10.1)	113.6 (8.9)	0.041	0.013
DBP (mmHg)	80.9 (10.0)	81.5 (11.4)	84.2 (9.7)	84.2 (9.7)	81.2 (7.9)	82.8 (6.9)	0.023	0.013
VO2max (mL/(kg/min))	43.81 (3.71)	43.01 (4.12)	42.3 (1.23)	30.81 (3.05)	31.7 (2.9)	31.23 (2.43)	0.004	0.41
Resting pulse rate (bpm)	74.06 (3.71)	87.14 (9.7)	70.7 (5.31)	78.12 (6.45)	81.92 (4.09)	76.01 (8.21)	0.105	0.037
Recovery pulse rate (bpm)	146.9 (14.3)	140.6 (16.3)	157 (14.86)	162.01 (15.7)	168.72 (16.1)	154 (12.56)	0.306	0.610

Note: Statistically significant at a p-value < 0.05

Abbreviations: DBP, diastolic blood pressure; SBP, systolic blood pressure; VO2max, maximum volume of oxygen uptake; bpm; beat per minute; P1, Independent samples *t*-test comparison between Genders; P2, repeated ANOVA for comparison among time points.

Table 2 Shows Interpretation of Physical Activities of MET According with IPAQ

IPAQ	Males	Females	p-value
Walking MET (min/week)	1237.06 ± 873.8	1191.32± 736.51	0.071
Moderate MET (min/week)	1041±921.4	9614.31 ± 827.64	0.035
Vigorous MET (min/week)	2781± 1987.01	1832.94±1317.82	0.029

Note: Statistically significant at a p-value < 0.05

Abbreviations: IPAQ, international physical activity questionnaire; MET, metabolic equivalent of task.

intended to observe if PA relates to changes in dietary habits. In according to the result the study intended to observe habits of their physical activity and to propose some strategies that help to increase the data obtained. Students' physical condition and nutritional patterns are closely linked to their attitudes toward health promotion and disease prevention, according to a variety of studies assessing university students' PA, diet, and fitness status.[12,13] Transitioning to college life can be a period of labor and social complexity, and peer pressure can contribute to the creation of a variety of negative behaviors.[14,15]

As a result, university students are one of the groups whose lifestyles should be monitored, which is why they were recruited as the focus of this study.

The Major Findings of This Study

VO2max

The study participant's predicted VO2max was significantly higher in males than age-matched female counterparts, despite having similar lifestyles and dietary adherence. Previous research has found that VO2max is higher in males than females, regardless being expressed in absolute or relative to lean body mass.[16] These disparities were not eliminated when VO2max was expressed in terms of fat-free mass or lean body mass, but they were significantly decreased. Men have a higher ventricular ejection rate, hemoglobin concentration, muscle density, and lower body fat, all of which contribute to their substantially higher VO2max values than women.[17] And also since HR is used to estimate VO2max, questions about medications, caffeine, eating, nicotine, and other factors that influence HR were asked as a precaution before taking the phase test at this study. This is because caffeine may underestimate VO2max as HR increases, while nicotine may overestimate VO2max as HR decreases. The overall VO2max level scoring for most of the study subjects at this study remained in the low group, based on average VO2 max values for untrained male and female adults.[18]

Dietary Practices

Unlike our study, many previous studies did not take into account the individuals' dietary patterns and daily life activities, but rather their status as a player or elite athlete before to the study period.[19] This research shows that VO2max has a strong link to levels of physical activity, but not to dietary

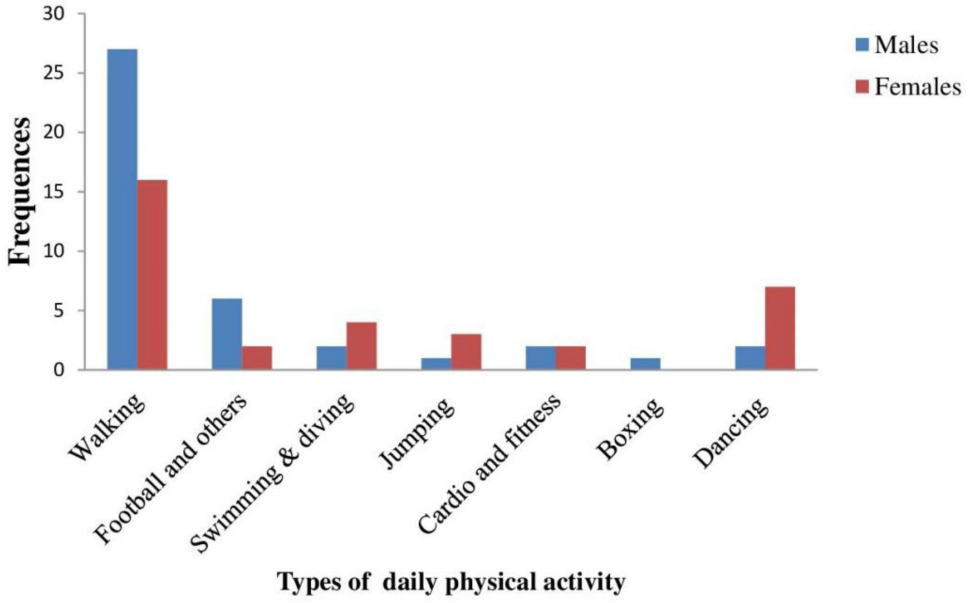

Figure 1 The various types of student's physical activities engaged in on regular basis.

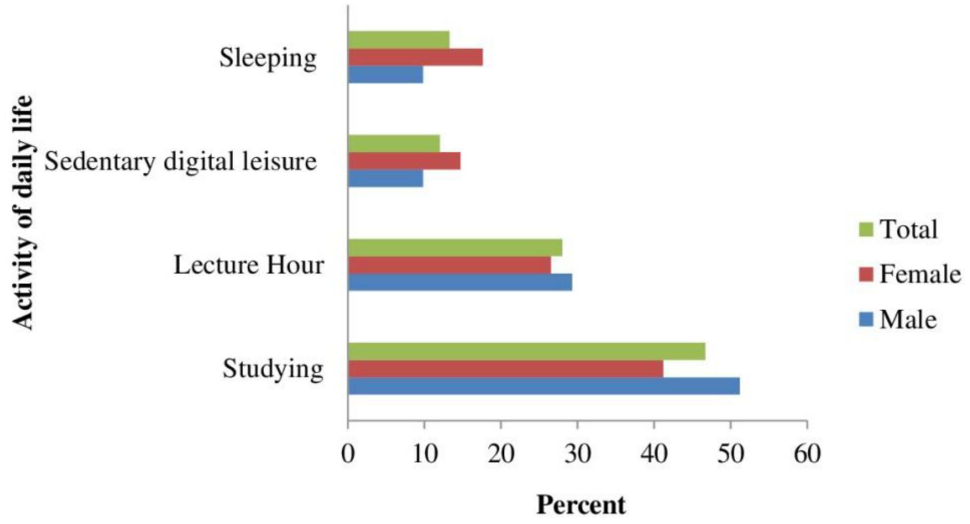

Figure 2 The percentage of time spent on daily living activities by both male and female students.

habits. Similarly, claimed that a vegetarian diet is neither beneficial nor harmful to physical performance metrics, even when followed for decades.[19] But, in the first part of this study,[20] it was proposed that a seven-week transition to a vegan diet may confirm optimal physiological and lipid parameters, with females showing a more favorable improvement than their age-matched male counterparts.

Daily Living Activities

Furthermore, participants in this study engaged in different types of physical activity on a daily basis. Walking was the most common physical activity among both males and females, with dancing being especially popular among females. However, except for vigorous PA, walking and moderate PA did not show marked differences between genders.

The majority of the participants in the current study spent 35 (46.7%) of their time studying and 17 (22.7%) of their time attending class lectures, with some students using more time than others. Females spent more time on sedentary digital leisure such as watching TV shows or playing video games, and sleeping than males. According to the findings,

every 2 hours per day rise in static posture was linked to a 5% increase in body weight among the working population over the same period.[21] In this regard, we observed significant changes in body weight, BMI, and blood pressure compared with the baseline in both male and female study participants.

Strength and Limitation

The current study had a few limitations that should be considered. Firstly, this was a cross-sectional study, which did not allow us to determine the direction of the association between studied factors and physical activity levels. Secondly, since only university students were involved in this study,the results of this study probably cannot be used to other populations. The future prospective study can design the framework based on the currently identified factors. Secondly, the self-reported data of physical activity may not be accurate due to recall bias, which cannot be generalized. Nevertheless, the present study is the fore research to describe the situation of physical activity habits of college students. The results of the present study may provide useful baseline data for the government sector or healthcare professionals to monitor and promote physical activity among university students.

Conclusion

In summary, significant differences in VO2 max, BP, BMI and body weight between age-matched male and female students was noted. Changes in eating habits are unrelated to levels of physical activity at this study. According to the findings of this limited prospective study, students spend the majority of their time engaging in sitting for various purposes. In turn, regardless of whether they followed a vegan or omnivorous diet, these study participants had low VO2 max. As a result, they could be at increased risk for a variety of lifestyle-related chronic diseases. Researches that may conduct in university and/or college students may provide early information to help the students understand their physical fitness.

Highlights

- University or college enrollment brings new relationships and opportunities for sedentary behavior.
- In such a setting, early identification and recognition of physical activity will provide early insight into students' physical health. This time of growth could be their last chance to receive low-cost health education and preventive measures.
- This form of research, which begins at the university level and then spreads to the general public, is easy, inexpensive, and should be boosted more regularly to increase national and even global levels of physical activity.
  - For instance, though insufficiently, Ethiopia began a once-month "car free day" initiative on major roads in major cities to promote physical activity to prevent and treat non-communicable diseases.

Data Sharing Statement

All data generated or analyzed during this study are included in this published article.

Ethics Approval and Consent to Participate

The study was carried out in agreement with the Announcement of Helsinki and was approved by the Institutional Ethical Review Committee of Addis Ababa University Department of Medical Physiology. Participants were given written informed consent. Isolated offices or zones in a room, as well as isolated times for men and ladies, were held for all measurement. Subjects were given an information sheet and the test was clarified after they gave their consent.

Consent for Publication

I the author of this research give my consent for publication of identifiable details within the text to be published in the above journal and Article. Informed consent to publish these identifiable images or information have been obtained from the participants.

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Disclosure

The author reports no conflicts of interest in this work.

References

1. Rowlands AV; World Health Organization. *Global Action Plan on Physical Activity 2018–2030: More Active People for a Healthier World*. World Health Organization; 2019.
2. Crombie AP, Ilich JZ, Dutton GR, Panton LB, Abood DA. The freshman weight gain phenomenon revisited. *Nutr Rev*. 2009;67 (2):83–94. doi:10.1111/j.1753-4887.2008.00143.x
3. Yan Z, Cardinal BJ. Increasing Asian International College students' physical activity behavior: a review of the youth physical activity promotion model. *Health Educ (Muncie)*. 2013;45(1):35–45.
4. Pengpid S, Peltzer K. Physical inactivity and associated factors among university students in South Africa. *Afr J Phys Health Edu Recreat Dance*. 2013;19(1):143–153.
5. Keating XD, Guan J, Piñero JC, Bridges DM. A meta-analysis of college students' physical activity behaviors. *J Am Coll Health*. 2005;54(2):116–125. doi:10.3200/JACH.54.2.116-126
6. Bouchard C, Blair SN, Haskell WL. *Physical Activity and Health*. Leeds: Human Kinetics; 2018.
7. Swinburn BA, Caterson I, Seidell JC, James WP. Diet, nutrition and the prevention of excess weight gain and obesity. *Public Health Nutr*. 2004;7(1a):123–146. doi:10.1079/PHN2003585
8. Rocha NP, Milagres LC, Longo GZ, Ribeiro AQ, de Novaes JF. Association between dietary pattern and cardiometabolic risk in children and adolescents: a systematic review. *J Pediatr*. 2017;93 (3):214–222. doi:10.1016/j.jpedp.2017.02.015
9. Silva VS, Vieira MF. International Society for the Advancement of Kinanthropometry (ISAK) Global: international accreditation scheme of the competent anthropometrist. *Rev Bras Cineantropometria Desempenho Hum*. 2020;22. Available from: https://www.scielo.br/j/rbcdh/a/wnxqYZCNbHc44NgwcC9kWGWP/?lang=en&format=html. Accessed August 4, 2021.
10. American College of Sports Medicine. *ACSM's Guidelines for Exercise Testing and Prescription*. Lippincott Williams & Wilkins; March 4, 2013.
11. McArdle WD, Katch FI, Katch VL. *Essentials of Exercise Physiology*. Philadelphia: Lea and Febiger; 1994:271.
12. Haase A, Steptoe A, Sallis JF, Wardle J. Leisure-time physical activity in university students from 23 countries: associations with health beliefs, risk awareness, and national economic development. *Prev Med*. 2004;39(1):182–190. doi:10.1016/j.ypmed.2004.01.028
13. Nasui B, Popescu C. The assessment of the physical activity of Romanian university students. *Palestrica Third Millennium Civilization Sport*. 2014;15(2):107–111.
14. Chacón-Cuberos R, Zurita-Ortega F, Olmedo-Moreno E, Padial-Ruz R, Castro-Sánchez M. An exploratory model of psychosocial factor and healthy habits in university students of physical education depending on gender. *Int J Environ Res Public Health*. 2018a;15:2430. doi:10.3390/ijerph15112430
15. Erturan-Ilker G, Yu C, Alemdaroglu U, Köklü Y. Basic psychological needs and self-determined motivation in PE to predict health related fitness level. *J Sport Health Res*. 2018;10:91–100.
16. Armstrong N, Welsman JR. Assessment and interpretation of aerobic fitness in children and adolescents. *Exerc Sport Sci Rev*. 1994;22 (1):435–476. doi:10.1249/00003677-199401000-00016
17. Cheuvront SN, Carter R, DeRuisseau KC, Moffatt RJ. Running performance differences between men and women. *Sport Med*. 2005;35(12):1017–1024. doi:10.2165/00007256-200535120-00002
18. Heyward VH, Gibson A. *Advanced Fitness Assessment and Exercise Prescription 7th Edition*. Human kinetics; 2014.
19. Nieman DC. Exercise, infection, and immunity. *Int J Sports Med*. 1994;15(3):S131. doi:10.1055/s-2007-1021128
20. Sisay T, Tolessa T, Mekonen W. Changes in biochemical parameters by gender and time: effect of short-term vegan diet adherence. *PLoS One*. 2020;15(8):e0237065. doi:10.1371/journal.pone.0237065
21. Tremblay MS, Colley RC, Saunders TJ, Healy GN, Owen N. Physiological and health implications of a sedentary lifestyle. *Appl Physiol Nutr Metab*. 2010;35(6):725–740. doi:10.1139/H10-079