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PHYSICAL ACTIVITY PROFILE, EATING HABITS, AND BODY COMPOSITION STATUS IN LEBANESE UNIVERSITY STUDENTS: COMPARATIVE STUDY

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УНИВЕРЗИТЕТ У БЕОГРАДУ

ФАКУЛТЕТ СПОРТА И ФИЗИЧКОГ ВАСПИТАЊА

Фади А. Фајад

ПРОФИЛ ФИЗИЧКЕ АКТИВНОСТИ, НАВИКА У ИСХРАНИ И ТЕЛЕСНЕ КОМПОЗИЦИЈЕ КОД СТУДЕНАТА ЛИБАНСКИХ УНИВЕРЗИТЕТА: УПОРЕДНА СТУДИЈА

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Physical Activity Profile, Eating Habits, And Body Composition Status in Lebanese University Students: Comparative Study

ABSTRACT

Introduction: High school students' weight gain is observable in the period of their transition from school to university. In universities, students encounter several challenges in adopting a new lifestyle due to study stress, time management problems, busy class schedules and other challenges. All these chellenges make those students unaware about their health. During this transition period of life, university students are vulnerable to unhealthy eating patters and sedentary lifestyle behaviors such as fast food snacking, meal skipping, excessive smoking and alcohol consumption, excessive internet use as well as inactivity. These unhealthy lifestyle behaviors comprised of sedentary behaviors including low level of physical activity, sitting for long hours of study, combined with unhealthy eating habits like fast food snacking, meal skipping, low consumption of fruits and vegetables, low intake of dietary products, are associated with weight gain and obesity in this critical life age. Therefore, these worrisome unhealthy lifestyle behaviors calls for appropriate lifestyle changes before disease development and morbidity.

Purpose: The purpose of the study is to examine the relationships between the two most important factors of quality of life, such as physical activity and dietary (eating) habits, and to determine their impact on body composition, and all in relation to student specialty and gender characteristics among Lebanese universities' students.

Methods: The studied sample included 384 Lebanese student from the Lebanese University, Faculty of Education. These students were divided into 4 subsamples for the purpose of this dissertation, 100 sport male student, 100 sport female students, 70 non-sport male students, and 114 non-sport female students. The three-lifestyle factors: Physical Activity, Dietary habits, and Body composition were identified and assessed. Physical Activity was assessed using the self-administered extended form English version of IPAQ (International Physical Activity Questionnaire) containing 27 questions that covers four (4) domains of physical activity (work-related physical activity, transport-related physical activity, domestic (housework) and gardening (yard) activities, leisure time physical activity), along with the time spent sitting. All questions refer to the previous 7 days. As for Nutrition habits, the standardized Dietary questionnaire was used including four sections: Eating Habits, Physical Activity, Dietary Beliefs, and Nutrition Knowledge. Body Composition was assessed using the method of multifrequency bioelectrical analysis. A multi-channel bioelectric impedance analyzer InBody 270 (Biospace Co. Ltd, Seoul, Korea) was utilized to measure sets of five primary direct measures of body composition variables (BM, BH, BFM, SMM, TBW) and seven derived indirect measures (BMI, PBFM, BFMI, PSMM, SMMI, IH, MFI).

Results: Starting with body composition, all Lebanese students' samples were found in normal body weight except the non-sport male students which were found overweight.

Comparative results showed that the Sport specialty students had better and healthier body composition profile than their non-sport colleagues. Sport males had better body composition status than non-sport males with significant differences in 10 variables (BM, BMI, BFM, PBFM, BFMI, SMM, SMMI, TBW, IH, and MFI). Sport females also showed better body composition status than non-sport females with significant differences in 8 variables (BM, BMI, BFM, PBFM, BFMI, SMMI, TBW, and MFI). As for gender-based classification, as expected, male students were taller and heavier than females on average in both sport and non-sport specialization categories. It can be noted that most primary and derived parameters' values were higher in male students, which contributes to higher total body mass (BM) and body height (BH) in males. Significant differences were found in all indices between males and females of the sport sample, however, the non-sport sample showed that males had better body composition with significant differences in all variables except (PBFM).

In terms of physical activity, the sport sample male and female students met the recommended weekly level (a minimum of 150 minutes of moderate-intensity aerobic physical activity per week, or 75 minutes of vigorous-intensity aerobic physical activity per week, or an equivalent combination of moderate and vigorous-intensity physical activity per week), whereas the non-sport sample male and female students did not.

The Lebanese university students showed at average a satisfactory level of continuous physical activity scores 4285 (MET/min/week) since the sport sample students' results were 6447 MET/min/week in males, and 5434 MET/min/week in females, and the results of the non-sport sample were 2846 Met/min/week in males and 2413 Met/min/week in females. However, the physical activity categorical score of Lebanese students was alarming since around half of Lebanese students were classified with a low physical activity level (46% n= 177), while 23.5% (n= 90) showed high level, and 30.5% (n= 117) showed a moderate level. Although the percentage of sedentariness or sitting hours per day was high in the Lebanese university students (6.25 hours/day), it was considered consistent and even better than some international similar studies' samples.

As for Eating Habits, although all Lebanese students' samples showed satisfactory results and scored above average in the four sections of the nutrition survey, the physical education and sport specialty students showed healthier dietary habits, higher physical activity rated level, more comprehensiveness in dietary beliefs, but lower level of nutritional knowledge than their non-sport peers did. Regarding gender-based classification, males showed better scores in sections of dietary habits and nutrition knowledge, while females showed better scores in physical activity rated level, and nutrition beliefs. The non-parametric Chi-square test used to determine expected and observed results in healthy eating habits of the Lebanese students' sample has found that the healthiest eating habits were reported by less than one third of the Lebanese students' sample (n=384).

Finally, the multiple regression analysis technique conducted on the four students' sample groups to examine the significant impacts of physical activity and dietary habits on body composition showed that only dietary habits have mild to

moderate impact on body composition specifically on its three primary dependent variables BM, BFM, and SMM.

Conclusion: It can be concluded that Students of Physical Education and Sport Sciences had better dietary habits, higher levels of physical Activity, and better body composition status than students of other university specialisms. Moreover, Students of Physical Education and Sports Sciences met the International standards of physical activity levels whereas students of other University specialisms did not. There were significant differences in the means of levels of Physical Activity and Body Composition between female and male students of Physical Education and Sports Sciences and their peers from other University specialisms. Nutritional Habits had stronger influence on Body Composition than physical activity independent on gender.

Significant (moderate to high) correlations between the body composition indices and the variables of the two life style factors (Physical activity and Dietary habits) of the Lebanese students were not determined by Pearson Correlation analysis. The independent variables or predictors of the two sections of the eating habits dietary survey frequency of food consumption including 10 variables, and Dietary habits including 13 variables, carried low to moderate significant impact on body composition primary indices (BM, BFM, and SMM). However, the physical activity predictors did not share the same significant impact on body composition. Therefore, we can definitely consider that the general research hypothesis Hg - Eating habits and physical activity are independent factors that statistically significantly affect the quality of body composition in Lebanese university students was partially true or Hg was partially accepted.

In light of the current findings of the study, the following recommendations and suggestions should be taken into consideration: the significant differences in variables of lifestyle factors and health measures, as well as the similarities in these variables among specialties, and genders of the Lebanese University students call for the development of targeted health-promotion programs with regular healthy lifestyle monitoring and standardized assessments. These findings support the need from educational and health authorities to develop and evaluate health-promotion and obesity-prevention programs for university communities especially for non-sport university specialties and female gender.

Future research must study lifestyle behaviors of larger and diverse Lebanese student samples and must, however, include high-technology measurement methods.

Keywords: Physical Activity, Nutrition, Body Composition, Sedentary Behavior, Lifestyle, University Students.

Scientific Field: Physical Education and Sport

Scientific subfield: Science of Physical Education

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Профил физичке активности, навика у исхрани и телесне композиције код студената либанских универзитета: упоредна студија

Резиме

Увод: Прелазак из средње школе на колец или универзитет је критичан период за повећање телесне масе. Млади одрасли на универзитетима се генерално суочавају са различитим изазовима као што су усвајање новог окружења, стрес од учења, недостатак правилног управљања временом и интензиван распоред часова који доводе до недостатка свести о свом здрављу. Током овог периода живота, студенти практикују неке нездраве навике у исхрани и стилове живота као што су прескакање оброка, једење грицкалица, конзумација брзе хране, пушење, прекомерна употреба интернета, физичка неактивност и седентарно понашање. Низак ниво физичке активности (ФА) у комбинацији са седентарним понашањем (нпр. гледање телевизије, седење уз рачунар) такође је повезан са повећањем телесне масе и гојазношћу. Нездраве дијететске навике међу студентима, као што су избегавање оброка, мала конзумација воћа и поврћа, висок унос брзе хране и низак унос млечних производа забрињавају и појачавају потребу за раним откривањем нездравих навика у исхрани, тако да се могу направити одговарајуће промене начина живота пре као превентива могућих здравствених поремећаја.

Циљ: Циљ рада је да се испитају односи између два најважнија фактора квалитета живота, као што су физичка активност и навике у исхрани, и да се утврди њихов утицај на телесну композицију, а све у вези са врстом студија и родним карактеристикама студената либанских универзитета.

Методе: Проучавани узорак обухватао је 384 либанска студента са Педагошког факултета Универзитета у Либану. Ови студенти су за потребе ове дисертације подељени у 4 подузорка, 100 студената спорта, 100 студенткиња спорта, 70 студената који се не баве спортом и 114 студенткиња неспортиста. Идентификовани су и процењена три фактора начина живота: физичка активност, навике у исхрани и композиција тела. Физичка активност је процењена коришћењем проширене енглеске верзије IPAQ (Интернационални Упитик о Физичкој Активности) која садржи 27 питања која покривају четири (4) домена физичке активности (физичка активност у вези са радом, физичка активност везана за транспорт, кућни послови и баштенске тј. дворишне активности, физичка активност у слободно време), као и време проведено седећи. Сва питања су се односила на претходних 7 дана. Што се тиче навика у исхрани, коришћен је стандардизован упитник о исхрани који укључује четири одељка: навике у исхрани, физичка активност, уверења о исхрани и знање о исхрани. Композиција тела је процењена методом мултифреквентне биоелектричне анализе.

Вишеканални биоелектрични анализатор импедансе ИнБоди 270 (Biospace Co. Ltd, Seoul, Korea) је коришћен за процену скупова од пет примарних директних мера (BM, BH, BFM, SMM и TBW) и седам изведених индиректних мера (BMI, PBFM, BFMI, PSMM, SMMI, IH, MFI) варијабли телесне композиције.

Резултати: Почевши од састава тела, сви узорци либанских студената су дефинисани са нормалном телесном масом, осим студената који се нису бавили спортом, и који су имали прекомерну масу. Упоредни резултати су показали да су студенти специјалности Спорт имали бољи и здравији профил телесне композиције од својих колега који се не баве спортом. Мушкарци са Факултета спорта су имали бољи статус телесне композиције од мушкараца који се не баве спортом са значајним разликама у 10 варијабли (BM, BMI, BFM, PBFM, BFMI, SMM, SMMI, TBW, IH, и MFI). Девојке са Факултета спорта су такође показале бољи статус телесне композиције од осталих девојака са значајним разликама у 8 варијабли (BM, BMI, BFM, PBFM, BFMI, SMMI, TBW, и MFI). Што се тиче класификације на основу пола, очекивано, студенти су били виши и тежи од студенткиња у просеку, као и у категорији спортске и неспортске специјализације. Може се приметити да је већина примарних и изведених параметара била већа код ученика мушког пола, што доприноси већој укупној телесној маси (BM) и телесној висини (BH) код мушкараца. Утврђене су значајне разлике у свим индексима између мушкараца и жена спортског узорка, међутим, неспортски узорак је показао да мушкарци имају бољу телесну композицију са значајним разликама у свим варијаблама осим (PBFM).

Што се тиче физичке активности, спортски узорак студената и студенткиња задовољио је препоручени недељни ниво физичке активности (најмање 150 минута аеробне физичке активности умереног интензитета недељно, или 75 минута аеробне физичке активности снажног интензитета недељно, или еквивалентна комбинација физичке активности умереног и великог интензитета недељно) за разлику од неспортских мушких и женских узорака студената који нису испунили овај препоручени недељни ниво.

Студенти либанског универзитета су у просеку показали задовољавајући ниво резултата континуиране физичке активности (4285 MET/мин/седмично) пошто су резултати студената спортског узорка били 6447 MET/мин/седмично код мушкараца и 5434 MET/мин/седмично код девојака, а резултати неспортског узорка били су 2846 Мет/мин/недељно код мушкараца и 2413 Мет/мин/недељно код девојака. Али категорички скор физичке активности либанских студената био је алармантан јер је око половине узорка класификовано са ниским нивоом физичке активности (46% н= 177), док је 23.5% (н= 90) показало висок ниво, а 30.5% (н = 117) показао је умерен ниво. Иако је проценат седентарних сати или сати седења дневно био висок код либанских студената (6.25 сати дневно), сматра се да је доследан и чак бољи од узорака неких међународних сличних студија.

Што се тиче навика у исхрани, иако су сви узорци испитиваних студената показали задовољавајуће резултате и постигли изнад просечне вредности у четири дела анкете о исхрани, студенти специјалности физичког васпитања и спорта показали су здравије навике у исхрани, виши ниво оцене физичке активности, свеобухватнија уверења о исхрани, али и нижи ниво знања о исхрани од њихових вршњака који се не баве спортом. Што се тиче резултата заснованих на полу, мушкарци су показали боље резултате у односу на прехрамбене навике и знања о исхрани, док су жене показале боље резултате у нивоу оцене физичке активности и уверењима о исхрани. Непараметарски Хи-квадрат тест који се користи за одређивање очекиваних и уочених резултата у здравим навикама у исхрани узорка либанских студената је утврдио да је мање од једне трећине узорка пријавило најздравије навике у исхрани (н=384).

Коначно, техника анализе вишеструке регресије спроведена на четири групе узорака ученика да би се испитао значај утицаја физичке активности и навика у исхрани на састав тела показала је да само навике у исхрани имају благи до умерени утицај на композицију тела, посебно на његове три примарне зависне варијабле BM, BFM, и SMM.

Закључак: Може се закључити да су студенти физичког васпитања и спортских наука имали боље навике у исхрани, виши ниво физичке активности и бољи статус телесне композиције од студената других универзитетских смерова. Штавише, студенти физичког васпитања и спортских наука су испунили међународне стандарде нивоа физичке активности, док студенти других универзитетских специјалности нису. Постојале су значајне разлике у средњим вредностима нивоа физичке активности и композиције тела између студенткиња и студената физичког васпитања и спортских наука и њихових вршњака са других универзитетских смерова. Навике у исхрани су имале јачи утицај на композицију тела него физичка активност независно од пола.

Значајне (умерене до високе) корелације између индекса телесне композиције и варијабли два фактора животног стила (физичке активности и навика у исхрани) либанских студената нису утврђене Пирсоновом корелационом анализом. Независне варијабле или предиктори два одељка прехрамбених навика у учесталости конзумирања хране, укључујући 10 варијабли, и дијететских навика укључујући 13 варијабли, имали су низак до умерен значајан утицај на примарне индексе телесне композиције (BM, BFM, и SMM). Међутим, предиктори физичке активности нису имали исти значајан утицај на композицију тела. Стога се дефинитивно може сматрати да је општа хипотеза истраживања Hg – Навике у исхрани и физичка активност независни фактори који статистички значајно утичу на квалитет телесне композиције код либанских студената делимично тачна или је Hg делимично прихваћена.

У светлу тренутних налаза студије, следеће препоруке и сугестије треба узети у обзир:

потребу развоја циљаних програма промоције здравља са редовним праћењем здравог начина живота и стандардизованим проценама истог. Налази ове студије подржавају потребу образовних и здравствених власти да развију и евалуирају програме у простору фактора животног стила и здравствених мера, као и развоја ових мера међу различитим образовним специјалностима у функцији пола код студената Либанског универзитета у смислу промоције здравља и превенције гојазности за универзитетске заједнице, посебно за неспортска универзитетска усмерења и у односу на популацију студенткиња.

Будућа истраживања морају проучавати начин живота већих и разноврсних узорака либанских студената и, међутим, морају се укључити и високотехнолошке методе мерења испитиваног простора.

Кључне речи: физичка активност, исхрана, састав тела, седентарно понашање, начин живота, студенти.

Област науке: Физичко васпитање и спорт

Научна подобласт: Наука о физичком васпитању

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ABBREVIATIONS

WHO – World Health Organization
PA – Physical Activity
BRF – Behavioral Risk Factors
IPAQ – International Physical Activity Questionnaire
ACSM– American College of Sports Medicine
MET – Metabolic Equivalent
DRI – Dietary Reference Intakes
BMI – Body Mass Index
FM – Fat Mass
FFM – Fat-Free Mass
PBF – Percent of Body Fat
PSMM – Percent of Skeletal Muscle Mass
BFM – Body Fat Mass
LBM – Lean Body Mass
CNS – Central Nervous System
SMM – Skeletal Muscle Mass
PM – Protein Mass
FT – Fat of Trunk
BFMI – Body Fat Mass Index
PFI – Protein-Fat Index
IH – Index of Hypokinesia
MFI – Muscle Fat Index
BM – Body Mass
BH – Body Height
WC – Waist Circumference
ADP – Air Displacement Plethysmography
DXA – Dual-Energy X-Ray Absorptiometry
BIA – Bioelectrical Impedance Analysis
TBW – Total Body Water
ICW – Intracellular Water
ECW – Extracellular Water
HDL-C – High Density Lipoprotein Cholesterol
VPA – Vigorous Physical Activity
MPA – Moderate Physical Activity
LMP – Light Physical Activity
EE – Energy Expenditure
BMR – Basal Metabolic Rate
CVD – cardiovascular disease
PCR – Phosphocreatine
ATP – Adenosine Triphosphate
ADP – Adenosine Diphosphate
TCA – Tricarboxylic Acid
DIT – Diet-induced thermogenesis
LU – Lebanese University
SD – Standard Deviation

Min – Minimum
Max – Maximum
cV% – The Coefficient of Variation
ANOVA – Univariate Analyses of Variance
L.O.C. – Levels of Confidence
MRA – Multiple Regression Analysis
SPSS – Statistical Package for the Social Sciences

1. INTRODUCTION

Diet and physical activity have a direct impact on adults' and children's health. Because the majority of the world's population is physically inactive, physical inactivity is regarded as a public health issue rather than an individual one (Kljajevic et al., 2021).

In terms of personal lifestyle behaviors such as physical activity, nutrition, and stress management, individuals, families, and societies' lifestyles can be healthy or unhealthy. An unhealthy lifestyle can cause illness and morbidity, whereas a healthy lifestyle can lead to better health and happiness (Saffari et al., 2013; El Baz, 2004).

Health is defined by the The World Health Organization (WHO) as the condition of complete mental, physical, and social well-being, rather than the lack of illness and/or infirmity (WHO, 1985, 1990). Nowadays, the concentration on energy outputs as results of physical activity and physical fitness has observed. Dangerous living consequences affecting youth has been attributed to the global problem of obesity and overweight. Proper and balanced nutrition combined with sufficient physical activity are necessary to obtain healthy lifestyle during youth period (Parizkova, 2010).

Eating habits and physical activity (PA) have been shown to have a significant impact on children's and youths' quality of life. Obesity, as a result of these factors, is a major public health concern in both developed and developing countries. As a result, because of the significance of its relationship with variables such as eating habits and physical activity, the construct of quality of life refers to health-related quality of life (Schneider et al., 2017).

The lifestyle behaviors and health risk factors of university students are important causes of their long-term health, as well as academic achievement and future career success (Ross & Wu, 1995; Deliens, 2013; Okanagan charter, 2016).

Educating university students about healthy behaviorial choices and in general a healthy lifestyle can be greatly achieved in university settings. University age is considered the optimal life period in yough for acquiring and developing lifelong lifestyle habits which will influence their whole life (Yahia et al., 2016). Succeeding in academic studies requires a lifestyle of balanced dietary and physical activity schedules (Taras, 2005). Young adults in universities face a diversity of challenges, including acclimating to a new environment, study stress, time management troubles, and a crowded class schedule, all of which contribute to a lack of awareness about their health (Ganasegeran et al., 2012; King et al., 2007).

Students engage in unhealthy eating habits and lifestyles such as meal skipping, snacking, fast food consumption, smoking, excessive internet use, inactivity, and sedentary behavior during this era of their lives. Sedentary activities (such as watching television, sitting, and computing) have also been associated with obesity and weight gain (Senjam & Singh, 2012; Ganasegeran et al., 2012; Gan et al., 2011; Maina et al., 2017; Meyer et al., 2008).

Young adults may scuffle to maintain a healthy lifestyle due to higher levels of stress in college and later in their occupations. It has been established that two-thirds of students gained weight during their first year of college as a result of stress, an unhealthy diet, and a lack of physical activity (Assaf et al., 2019). Students may spend hours reading and writing on their cell phones or computers. As a result, they are less likely to be motivated to participate in physical activities, increasing their chances of weight gain and obesity (Assaf et al., 2019). Unhealthy eating patterns like skipping meals, low fruit, vegetables, and dairy products consumption, are worrisome and call the need for a frequent lifestyle changee to avoid disease development (Yahia et al., 2016). In developing countries, urbanization, globalization, and nutritional transition are major drivers of unhealthy lifestyle behaviors (Candib, 2007; Popkin & Gordon-Larsen, 2004; Popkin, 1997). Rapid urbanization and globalization are accompanied by behavioral change, putting many people at risk of chronic noncommunicable diseases and mortality. The rapid economic transition has also resulted in lower levels of physical activity, fewer hours of rest, and higher levels of stress (Popkin & Gordon- Larson, 2004; Popkin, 1997). A physically active lifestyle, on the other hand, improves lung function and delays its decline in young adults. This emphasizes the importance of changing their lifestyle and incorporating measures such as exercise to improve their pulmonary function and overall health. As a result, it is critical that the younger generation incorporate some form of regular exercise regimen into their lifestyle in order to maintain their physical and mental well-being (Taruna et al., 2021).

Modifiable behavioral risk factors (BRFs) such as physical inactivity, tobacco use, and poor dietary habits have become more prevalent among Arab children and adults over the years (Rahim et al., 2014). Lebanon has been undergoing a nutritional transition in food choices over the last few years, shifting from the typical Mediterranean diet to a fast food pattern. The fast-food industry has an impact on the dietary habits of young Lebanese adults. As a result, young people are becoming increasingly overweight and obese (FAO, 2010).

According to the findings of research conducted in various countries around the world, insufficient activity, a poor quality diet, and smoking are critical health concerns among college students (Irwin, 2004; Steptoe et al., 2002).

Although various methods are used to measure physical activity, studies using the International Physical Activity Questionnaire (IPAQ) are currently the most valued, and it has been identified that this tool is a very reliable technique for measuring physical activity (Guillermo et al., 2019). In terms of Eating Habits, the Italian Dietary Questionnaire was used as a model based on previously published studies in which authors standardized its use among university students (Turconi et al., 2003).

Physical activity is indorsed by communities and schools ranging from preschools to colleges and universities. Through physical education and health programs, schools provide education for skill development and educate young people about healthy, active lifestyle choices. As a result, educational governing bodies must provide adequate resources for physical activity instruction and programs, such as budgets, facilities, and physical education and health education specialists (WHO, 2008a).

Differences in body composition and lifestyle behaviors among university students from various specializations should be prominently understood and identified in order to develop specific recommendations on health promotion to provide to students when they enter university. The findings of this study will assist health educators in developing tailored interventions and programs aimed at improving youth students' wellness and lifestyle behavior.

Due to all the above, it can be concluded that there is a need for a study in which to identify and compare Physical Activity, Eating Habits, and Body composition Profiles based on students' Specialties and gender characteristics among Lebanese universities' students.

2. THEORETICAL FRAMEWORK AND PREVIOUS RESEARCH

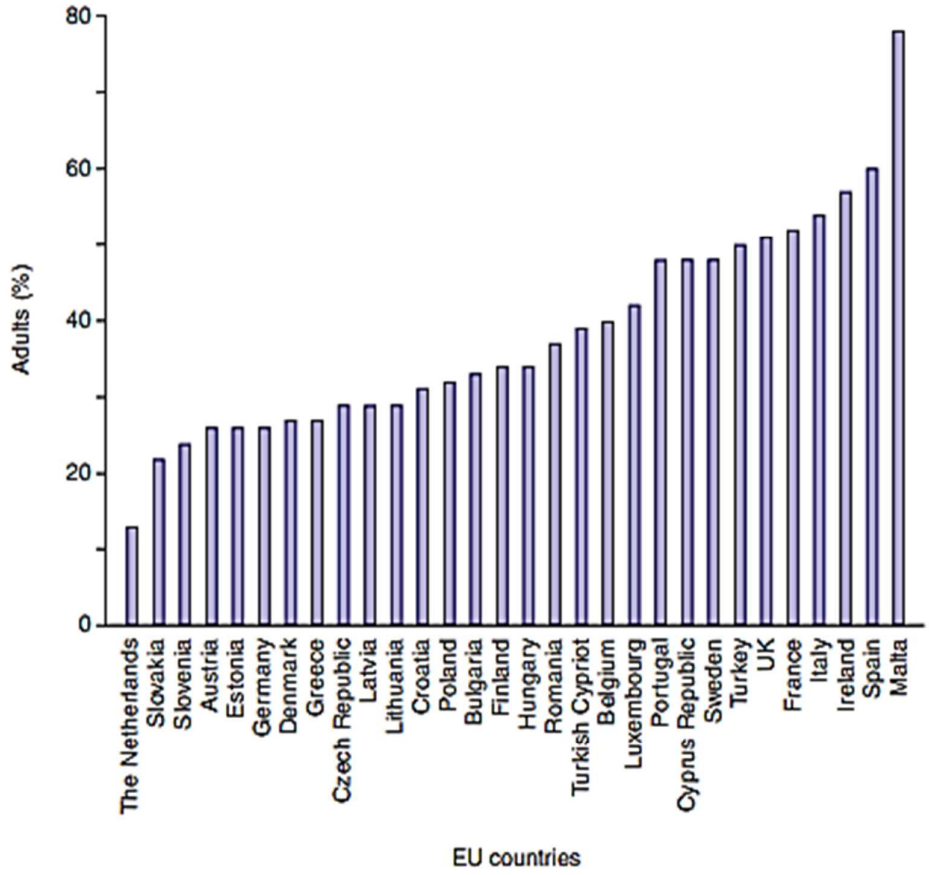
2.1. PHYSICAL ACTIVITY

2.1.1. Terms and Definitions

Physical activity is technically defined as "any force exerted by skeletal muscles that results in energy expenditure above resting level." This intentionally wide definition means that almost any type of physical activity is of importance, encompassing walking or cycling for the purpose of transportation, dancing, traditional games, gardening and housework, and sport or deliberate exercise. Thus, sport and exercise are viewed as distinct types of physical activity, with sport typically involving some form of competition and exercise typically aimed at improving fitness and health (Caspersen et al., 1985).

2.1.2. Prevalence of Activity/Inactivity Worldwide

Regimes and other health organizations monitor health behaviors, including physical activity, in order to obtain public health policy and assess the efficiency of behavior-change interventions. Many states only survey leisure-time physical activity because it is assumed that this type of activity is the most amenable to interventions and because occupational work is no longer common in westernized countries – the source of the majority of national data. Unfortunately, the methods used to assess physical activity vary, but it is clear that physical activity levels are low in many, if not the majority, of the countries. There are two commonly used approaches to obtain data on population physical activity levels: one is to report the proportion of individuals in a specific age/gender group who are arbitrated to be inactive, and the other is to report the proportion of individuals meeting the criteria that identify the minimal 'dose' of activity required for health benefits. Figure 1 depicts the percentage of adults in selected European countries who are classified as 'inactive' due to a lack of moderate-intensity physical activity (Hardman & Stensel, 2009).



Source: European Commission (2006).

Figure 1: Percentage of adults who do no moderate-intensity physical activity in a typical week, 2005, selected European Countries.

Most developed countries share two characteristics of physical activity data: a higher levels of activity in men than in women, and a rapid decline with increasing age. Activity levels within countries also differ significantly by racial/ethnic group. Adults of Bangladeshi or Pakistani origin are the least active in the United Kingdom, and Hispanics are the least active in the United States. Because a decline in physical activity appears to follow economic growth in developing countries, the prevalence of inactivity worldwide may be expected to rise as these countries' economies develop. Since 1972, the proportion of men and women who engage in high levels of leisure-time physical activity has increased, as has the proportion of women who participate at a moderate level (defined as at least four hours per week of activities such as walking or cycling) (Hardman & Stensel, 2009).

Other countries have recently begun to consistently monitor activity levels. Since 1996, the UK government's recommendation for physical activity has been that adults engage in at least 30 minutes of moderate-intensity activity on five or more days of the

week. Although the proportion of men and women achieving this level has increased in recent years to 40% of men and 28% of women in 2006, the majority of adults are still insufficiently active (Information Centre, 2008). In the United States, progress has also been slow with only 33% of adults being sufficiently active in 2003, compared to 32% in 1997: a small positive is that the prevalence of walking has increased slightly over these years. The Australian Bureau of Statistics, (2006) has declared that the proportion of those aged 15 and up who report sedentary or low exercise levels has remained stable over the last ten years, 69 percent in 1995, 69 percent in 2001, and 70 percent in 2004–5. In conclusion, it is clear that physical inactivity is still prevalent in developed countries. Inactivity is an even bigger problem in the developing world's rapidly growing cities. According to the WHO Global Strategy on Diet, Physical Activity, and Health, "*more than 60% of the world population is inactive or insufficiently active to gain health benefits*" (WHO, 2008b).

2.1.3. Physical Activity Compendium

The physical activity compendium created in 2000 and updated in 2011 by Ainsworth et al. is a coding scheme that specifies physical activity categories by rating them according to energy expenditure and therefore, intensity of exercise. This code scheme was widly used as a comparable tool across self-reported physical activity studies for the purpose to calculate the PA energy cost.

According to Ainsworth et al. (2011), people who engage in weekly diverse intensity activities can easily track their physical activity in specific details using the MET as a measurement unit. A MET (Metabolic Equivelant) is defined as a unit of energy expenditure which expresses the intensity of exercise. It is also defind as a ratio of a person's working metabolic rate compared to their resting metabolic rate. In more specific calculation, one MET is equivilant to the energy cost of sitting quietly and is equal to 1kcal/kg/hour of caloric consumption. We can also estimate the MET as oxygen uptake in milliliters per kilogram of body weight per minute, with one MET equal to the oxygen cost of sitting quietly, which is 3.5 milliliters per kilogram of body weight per minute.

Additions to the Compendium came from studies that described adults' daily PA patterns as well as studies that measured the energy cost of specific physical activities in field settings. According to Ainsworth's compendium, physical activities are divided into three categories: 1) Light activities are those that burn less than 3.0 METs. 2) Moderate activities requiring 3.0 to 6.0 METs; 3) Vigorous activities requiring more than 6.0 METs. (Appendix 4 shows specific classification in code scheming for all categories of Physical Activities based on the Ainsworth Compendium 2000 and its 2011 update version.)

A moderate intensity workout for instance as assessed in MET technique, can be presented in walking at 3 to 4 miles per hour, requiring 4 METs regardless of who is doing the activity. According to the Physical Activity Compendium (Ainsworth et al., 2000, 2011). Using this information as a background, we can look at the person mentioned at the beginning of the blog as an example:

• Walk at 5 METS for 30 minutes twice a week = 2 x 5 x 30 = 300 MET-minutes.

• Ride your bike once a week for 20 minutes at 7 METS = 1 x 7 x 20 = 140 MET-minutes.

• Elliptical machine twice a week for 40 minutes at 6 METS = 2 x 6 x 40 = 480 MET-minutes.

Total MET-minutes for the week = 300 + 140 + 480 = 920 MET-minutes.

It's important to remember that you don't have to go to the gym every time you want to be physically active. Work and housework both contribute to your weekly MET-minute goal. According to the Physical Activity Compendium, vacuuming and pushing a power lawn mower require 3.5 and 5.5 METS of energy, respectively. So, if you completed each of these tasks for 30 minutes in a single day, you would earn (3.5 x 30) + (5.5 x 30) = 270 MET-minutes.

Of course, if all of this math bores you to tears, you can estimate your caloric expenditure with a wearable device (Ainsworth et al., 2011).

2.1.4. Levels of Physical Activity

2.1.4.1. Continuous Classification of Physical Activity

- **Vigorous-intensity physical activities**

These activities allow people to sweat and become out of breath, or refer to activities that require a lot of physical effort and make you breathe much harder than usual. They usually involve some form of sport or exercise, such as running or fast cycling. Vigorous-intensity activities increase metabolism to at least six times its resting level (6 METs) (Ainsworth et al., 2011).

- **Moderate-intensity physical activity**

This type of activity increases the heart rate and causes the person to feel warm and slightly out of breath, or refers to activities that require moderate physical effort and cause you to breathe slightly harder than usual. It raises the body's metabolic rate to 3–6 times that of rest (3–6 metabolic equivalents – METs) (Ainsworth et al., 2011). According to Hardman and Stensel (2009), a moderate activity level is defined as at least four hours per week of activities such as walking or cycling.

- **Light intensity Physical Activity**

Does not meet the above standards and its Metabolic rate is less than 3 METs (Ainsworth et al., 2011).

2.1.4.2. **Categorical Classification of Physical Activity**

According to the International Physical Activity Questionnaire (IPAQ) Scoring Protocol (2005), the categorical classification of physical activity is divided into three levels: high level PA as meeting both criteria: A (>3 days of vigorous PA with >1500 METs/week) and B (>5 days of combined PA levels with >3000 METs/week). Moderate level PA also includes two conditions: A: (>3 days of Vigorous PA with >20 minutes per day), and B: (>5 days of Moderate or Walking with >30 minutes per day). Low level PA or sedentary behavior is defined as PA with criteria lower than these two levels.

2.1.4.3. **Recommended Levels of Physical Activity**

By the 1970s, there was a substantial literature on the type, intensity, frequency, and duration of exercise required to improve fitness – which was invariably interpreted as VO2max. The American College of Sports Medicine (ACSM) issued the first formal document, "Position statement on the recommended quantity and quality of exercise for developing and maintaining fitness in healthy adults" (American College of Sports Medicine, 1978). The recommendation was for 3–5 days per week of continuous aerobic activity at an intensity of 50–85 percent of VO2max for 15–60 minutes per session. Both this position statement and the 1990 update (American College of Sports Medicine, 1990) were well-founded in that most healthy adults would improve their personal fitness if they followed their recommendations. Many people assumed, and probably correctly, that this regimen would also result in health benefits, but this was not the basis on which it was designed. The ACSM and the American Heart Association jointly published updated recommendations for adults aged 18–65 in 2007 (Haskell et al., 2007). They also stated that aerobic activity is required in addition to light-intensity daily activities, and that 'short' bouts of activity should last at least ten minutes.

Appendix 5 contains the core recommendations from the 2007 statement, as well as important differences in guidance for older adults published in a companion paper by the same two authoritative bodies (Nelson et al., 2007). There is also agreement that these recommendations for adults are insufficient for children and adolescents. Recommendations for those aged 5–18 typically call for 60 minutes or more of moderate-intensity activity per day.

According to Hill et al. (2003), affecting energy balance by 0.42MJ/day (100 kcal/day) (via diet and exercise) may be sufficient to prevent weight gain in the majority of the population. To avoid obesity, the UK Department of Health (2004) recommends 45–60 minutes of exercise per day (5.25–7 hours per week). To prevent weight gain, the American College of Sports Medicine guidelines (Donnelly et al., 2009) recommend 150–250 minutes per week (2.5 – 4 hours per week) of moderate-intensity exercise. These are lower than the obesity targets set by the UK Department of Health, but the American College of Sports Medicine recommends that more physical activity (>250 minutes per week) leads to greater weight loss. Levine et al. (2006) propose an alternative weight-loss recommendation, claiming that obese people could reverse their condition if they exercised 1.5MJ/day (350 kcal/day) more (equivalent to standing and ambulating for an additional 2.5 hours each day). Obese people who have lost weight may need more

exercise than those who have never been obese. For those who want to avoid regaining lost weight, the UK Department of Health (2004) recommends 60–90 minutes of exercise per day, a viewpoint shared by other experts in the field (Jakicic & Otto, 2005; Hill & Wyatt, 2005).

Moderate-intensity physical activity for more active and fit people is fast walking or slow jogging. Most public health recommendations on physical activity focus on moderate-intensity activities, ensuring that a diverse range of activities is included. Students must engage in the following activities to meet the recommended level of physical activity: A daily walk (or cycle) to and from college, seizing any small opportunity to be active: utilizing the stairwell and carrying out manual tasks 2–3 midweek sports or exercise classes, visits to the gym or swimming pool, Longer walks, cycling, swimming, and sports are popular weekend activities (WHO, 2006).

2.1.4.4. **Recommended Minutes and Days per Week**

"*It is recommended that individuals engage in adequate levels [of physical activity] throughout their lives*," according to the WHO Global Strategy on Diet, Physical Activity, and Health. Different types and amounts of physical activity are required for different health outcomes: at least 30 minutes of moderate-intensity physical activity on most days lowers the risk of cardiovascular disease, diabetes, colon cancer, and breast cancer. Muscle strengthening and balance training can help older people avoid falls and improve their functional status. Weight loss may necessitate increased activity (WHO, 2008 b).

According to the current Public Health Guidelines for Physical Activity, adults must accumulate a minimum of 150 minutes of moderate intensity activity per week, or a minimum of 75 minutes of vigorous intensity activity per week, as well as two days per week of resistance training. These figures represent the amount of physical activity required to reap significant health benefits. If a high level of fitness or significant weight loss is desired, the time listed should be doubled (WHO, 2006).

2.1.4.5. **Recommended Mets per Week**

For significant health benefits, the Physical Activity Guidelines recommend 500-1,000 MET-minutes per week. If significant weight loss is your primary goal, you will most likely require more than this (Ainsworth et al., 2011).

The Compendium of Physical Activities is the simplest way for you to determine your MET level during physical activity (Ainsworth et al., 2011). The Compendium displays MET levels for hundreds of different types of physical activity (including household and occupational chores) at various intensities.

2.1.4.6. **Recommended Calorie Burning per Week**

Once you've determined your MET value, multiply it by 3.5 and then by your body weight in kilograms (divide your body weight in pounds by 2.2 to determine your weight in kilograms). Divide the result by 200 to find out how many calories you burn per

minute. Here's an example using someone weighing 180 lbs (82 kilograms) and working at a 10 METS intensity:

10 METS multiplied by 3.5 x 82 / 200 equals 14.4 Calories per minute. They would burn approximately 14.4 x 30 = 432 calories if they ran at this pace for 30 minutes. The Guidelines recommend burning 1000-2000 calories per week through physical activity for significant health benefits. If significant weight loss is your primary goal, you should set your long-term calorie expenditure goal higher than this (Ainsworth et al., 2011).

2.1.4.7. **Recommended Steps per Day**

Physical activity guidelines have been 'translated' into related indices based on pedometer readings of steps per day that approximate the associated energy expenditure. This approach, which reflects the idea that 'accomplishing' activity is one valid way to reach the recommended level of activity, was developed more than 30 years ago in Japanese walking clubs. The concept is well-liked by the media due to its simplicity. Adults should aim for 10,000 steps per day, which is widely accepted as a reasonable estimate of an appropriate level. The 10,000 target, on the other hand, is unlikely to be sustainable for older adults or those with chronic disease. This goal on the other hand is probably too low for children; better goals for 5–12-year-olds could be 15,000 and 12,000 steps per day, respectively. According to the Pedometer method classification for PA levels, a sedentary person walks less than 5000 steps per day, a low active person walks between 5000 and 7499 steps per day, a somewhat active person walks between 7500 and 9999 steps per day, and an active person walks more than 10000 steps per day. People who walk more than 12,500 steps per day are classified as "highly active" (Hardman & Stensel, 2009).

2.1.5. Methods of Physical Activity Assessment

In epidemiology, health-related results are frequently compared between groups that differ in their level of physical activity and/or fitness. The tools used for measurement are diverse, with varying strengths and weaknesses. Despite the fact that the number of studies that use fitness measurements has increased significantly, large epidemiological studies most commonly measure physical activity and/or inactivity (Hardman & Stensel, 2009). There are already a variety of methods for measuring physical activity, which can be divided into five broad categories: behavioral observation, questionnaires (including diaries, recall questionnaires, and interviews), physiological markers (such as heart rate), calorimetry, and motion sensors (Westerterp, 1999).

Wearable monitors are characterized with high accuracy in assessing physiological or mechanical parameters related to PA components and they are better than self-reported methods (Westerterp, 1999).

When it comes to motion sensors, this method meets the criteria of objectivity and suitability for measuring physical activity in large populations over long enough periods to be representative of normal daily life while causing the subjects minimal discomfort. Mechanical pedometers have given way to electronic accelerometers as motion sensors

for measuring physical activity. We're talking about accelerometers, which have the potential to reflect not only the occurrence of body movement (as a pedometer does), but also the intensity of movement. Several accelerometers are currently available for measuring physical activity. The Caltrac1 (Hemokinetics, Madison, WI), the Computer Science Application (CSA) accelerometer (Computer Science and Applications Inc., Shalimar, FL), the Mini Motionlogger Actigraph (Ambulatory Monitoring Inc., Ardsley, NY), and the Tritrac-R3 D accelerometer (Hemokinetics, Madison, WI) are commercially available examples (Westerterp, 1999). There are also accelerometers developed for non-commercial purposes, such as our laboratory's tri-axial accelerometer for movement registration (Tracmor). Because physical activity is defined as body movement produced by skeletal muscles and resulting in energy expenditure, accelerometers for physical activity assessment are based on the measurement of body movement, that is, the dynamic component of physical activity. Accelerometers cannot measure the static component of exercises such as weight lifting or carrying loads. In everyday life, however, it is assumed that the effect of static exercise on total level of physical activity is negligible. In general, and as a conclusion for this method, the tri-axial accelerometer is an objective method for distinguishing differences in activity levels between individuals and assessing the effect of interventions on physical activity within individuals (Westerterp, 1999). Ainsworth et al., (2015) defined accelerometers (also known as MEMS-based systems) as small wearable monitors that record accelerations in gravitational units on one or more planes at sampling rates greater than one time per second (typically 40–100 hz). Captured accelerations are then reduced in resolution (i.e., epoch) and calibrated to a known criterion measure (e.g., oxygen consumption, double-labeled water). Accelerometers are commonly worn on the hip, but are increasingly being attached to the wrist or ankle. Although recent comparative studies have shown only minor differences in accuracy between the hip and wrist accelerometers, hip-worn accelerometers are assumed to provide the most accurate assessments of normal ambulation (Welk, 2002; Zhang et al., 2012).

When it comes to pedometers, their ability to quantify ambulatory activity during walking, jogging, and running through a common and easily understood metric makes them appealing for objectively monitoring PA (i.e., steps). Pedometers are relatively inexpensive and can be an effective tool for providing behavioral feedback and motivation. They may also be able to provide an accurate estimate of PA intensity. The pedometer's primary disadvantages are its inability to measure non-ambulatory activities, posture, and energy expenditure, as well as its reliance on proprietary algorithms to calculate steps (Ainsworth et al., 2014).

Furthermore, heart rate monitors (HRMs) are physiological markers that are most commonly in direct physiological measures in free-living environments. There is a strong linear relationship between heart rate and Energy Expenditure (EE) in the moderate- to vigorous-intensity ranges of PA, but not in the light intensity range. Typically, overall error rates relative to the criterion measure are (Ainsworth et al., 2014).

Specific PA component of interest, rapid and evolving evolution of technology and algorithm development, and practical considerations such as ease of use, cost, and

logistics all influence the selection of a standard objective wearable monitor (Ainsworth et al., 2014).

Although there are many different ways to analyze physical activity data, there is no formal unified agreement or consensus on one 'targeted' method for defining or describing levels of physical activity based on self–report population surveys. The use of different scoring protocols makes comparing within and between countries difficult, even when the same instrument is used. When identical samplimg and correct research methods are used, these scoring methods will improve survey comparability (Craig et al., 2003).

Self-reported surveys classify subjects as physically active or inactive by addressing two to three questions which makes them the simplest protocol for PA measurement regardless the complexity of PA components like intensity, frequency and duration. A direct approach would be to inquire about participation in specific activities known to necessitate a high level of energy expenditure. Alternatively, questionnaires can be used to determine the frequency of an individual's exercise that he or she would describe as "vigorous" or that produces physiological responses associated with vigorous exercise. These indirect questions are useful for determining the level of physiological stress on the individual, which is determined by the relative, rather than total, intensity of physical activity. However, another way to describe the intensity of activity is to use metabolic equivalents (METs). This unit measures intensity in multiples of the resting metabolic rate (assumed to be 3.5 ml/kg/min).

In this research, the Lebanese university students have to complete the self-administered extended form English version of IPAQ (International Physical Activity Questionnaire) encompassing a 27 questions and covers four domains of physical activity (work- related physical activity, transport-related physical activity, domestic (housework) and gardening (yard) activities, leisure time physical activity), as well as the time spent sitting. All the survey questions refer back to the previous 7 days. The International Physical Activity Questionnaire (IPAQ) was created as a tool for cross-national monitoring of physical activity and inactivity with the goal of providing common tools for obtaining internationally comparable data on health-related physical activity. Because the Spearman correlation coefficient values are around 0.8, the IPAQ Questionnaire has acceptable psychometric properties for assessing PA levels with good reliability (Craig et al., 2003).

2.2. EATING HABITS

2.2.1. Nutrition

The study of nutrition emphasizes on the science of ingestion, digestion, absorption, metabolism, and biochemical functions of food nutrients. To begin with, these disciplines are founded on solid scientific evidence. Although food is simply consumed by humans for its taste and smell, scientists apply scientific principles to humans in identifing nutrients found in food that the body requires (Dunford & Doyle, 2007).

Foods and beverages that human consume are composed of six nutrients that are vital and necessary for the human body. These nutrients play a great role in producing body energy, growing and developing body tissues, regulating body processes, and prevent deficiency and deteriorating diseases. Macronutrients, including carbohydrates, proteins, and fats, whereas micronutrients include vitamins, minerals, and water. Our body needs those six nutrients to stay stable, healthy, and with proper functioning. It can not produce and manufacture them through its chemical and biological functions, therefore, they must be obtained by daily food intake (Wiseman, 2002).

2.2.2. Foods and Nutrients

2.2.2.1. Macronutrients

Carbohydrates, which are food molecules composed of carbon, hydrogen, and oxygen and include sugars and starches, are one of three macronutrients that provide energy to the body (protein and fats being the other two). Carbohydrates contain chemical compounds in both simple and complex forms, and in order for the body to use carbohydrates for energy, food must be digested, absorbed, and glycolyzed. Carbohydrates should account for 55 to 60% of total caloric intake (WHO, 1985). Simple carbohydrates in the diet are classified into two types: those with only one molecule (monosaccharides) and those with two molecules (disaccharides). Food contains primarily single-molecule carbohydrates such as fructose, glucose, and mannose, as well as dietary two-molecule carbohydrates such as sucrose, lactose, and maltose. Starch is the most common type of complex carbohydrate in the diet (Wiseman, 2002).

Proteins are made up of long chains of relatively small molecules known as amino acids. Proteins are split during digestion to release single amino acids, which are carried by the blood to the liver and then to all of the body's cells, where they are joined together in a new sequence to produce new proteins required by the body. Only about 20 amino acids are required to make all of the proteins found in the human body, nine of which are required (Lopez & Mohiuddin, 2021).

In terms of protein, a certain amount of protein is required in the diet at all times in order to provide the essential amino acids. In infants and young children, during periods of rapid growth, the demand for high-quality protein is high, whereas in healthy adult

men, the demand is low. In an adult, approximately 250 g of body protein is renewed each day, but because most of the old protein is re-used, only about 40–50 g of dietary protein are required to balance this turnover. It appears that 65 g of protein would be sufficient for all healthy adult men (Wiseman, 2002).

Instead of being a special occasion food, fat is the cheapest source of dietary energy, and its excessive consumption has resulted in a slew of health issues. Glycerides are the building blocks of dietary fat (also known as lipid). These are made up of fatty acid molecules linked together with glycerol (glycerine). Dietary fat fatty acids are classified as either saturated or unsaturated. About 2.5 g fat/kg body weight/day, is the maximum amount of fat that adults can normally metabolize which is about 175 g fat for an average 70 kg person, yielding about 1575 kcal per day, which is more than half of the average daily energy requirement. Most Western countries' current fat consumption, which accounts for 40 percent or more of daily energy requirements, is thus approaching the maximum tolerable fat intake (Wiseman, 2002).

2.2.2.2. **Micronutrients**

Vitamins are substances that are necessary for health but that the body cannot produce in sufficient quantities or at all. Some vitamins, such as vitamin B12 (about 0.1–1.0 mg per day), are required in minute amounts, whereas others, such as vitamin C (about 30–50 mg per day), are required in relatively large amounts (Wiseman, 2002). Minerals are non-carbon containing inorganic elements, ions, or compounds. They are essential nutrients because they play important roles in various bodily functions and are required to sustain life and maintain optimal health. The majority of minerals in the human diet come from plants and water, or indirectly from animal foods. The mineral content of water and plant foods, on the other hand, varies geographically due to variations in soil mineral content from region to region (James, 2004).

2.2.3. Energy and Nutrients for Physical Activity

To avoid storing excess body fat, an adult must balance his or her energy intake with his or her level of physical activity. Dietary practices and food choices influence health, fitness, weight management, and the prevention of chronic diseases such as osteoporosis, cardiovascular disease, cancer, and diabetes (James, 2004).

Although the human body has some energy reserves, the majority of its energy must come from food. Energy requirements increase during exercise, and energy provision can become critical. Energy provision is critical in athletes, and energy depletion (particularly carbohydrate depletion) is one of the most common causes of fatigue. Different types of exercise and sports require different amounts of energy. As a result, athletes must adjust their dietary intake accordingly (James, 2004). The body stores energy in the form of fat, glycogen, phosphocreatine (PCr), and adenosine triphosphate (ATP). ATP is the primary energy source used by muscles to perform work or generate force. The energy for muscle contraction is provided by the breakdown of ATP to adenosine diphosphate (ADP) and inorganic phosphate (Pi) by a specific muscle enzyme (myosin ATPase) (Alain, 2006).

2.2.4. Energy Balance

The energy balance, which represents the difference between energy intake and energy expenditure, is typically figured over longer time periods, such as days or weeks. The energy balance is "positive" when one's energy intake exceeds one's energy expenditure, resulting in weight gain. When the amount of energy expended exceeds the amount of energy intake, the energy balance becomes "negative," and weight loss occurs. Weight-stable individuals maintain long-term energy balance, even if this balance can be positive or negative on a daily basis (Alain, 2006).

Some physical activities necessitate a greater expenditure of energy than others. When played for recreation, tennis, for instance, has a low energy expenditure and could be classified as a light-to-moderate activity. During a game, however, the exercise can be vigorous at times, and the energy expenditure during that brief burst of intense exercise can be very high. The average energy expenditure for this activity is low because this high intensity is usually followed by a longer period of relatively low intensity, such as walking or standing. Tennis at the highest level will have much shorter rest periods and a much higher average intensity. Continuous sports, such as cycling and running, can have relatively high energy expenditures because there is usually little or no recovery during the activity. Body size, body composition, movement efficiency, goals, and the energy cost of training all have an impact on an individual's energy requirements (Alain, 2006; Priya & Joseph, 2008).

2.2.5. Obesity and Weight Management

Obesity is thought to be on the rise as a result of insufficient physical activity and excessive food consumption. Keith et al. (2006) labeled diet and exercise as the "Big Two" explanations for the obesity epidemic, while suggesting that other environmental influences, such as increased sleep debt, reduced variability in ambient temperature (due, for example, to central heating, which reduces the need for thermogenesis), and decreased smoking prevalence, may also play a role (smoking has thermogenic and appetite suppressing effects and smokers tend to weigh less than non-smokers).

Adults' weight management is an important factor in achieving health and wellness (ages eighteen to forty-five or fifty). To stay in good health, adults must be aware of changes in their energy needs based on their level of physical activity, and they must balance their energy intake accordingly (James, 2004).

The basal energy requirements for maintaining the body's physiological functions (basal metabolic rate, or BMR) stabilize as teenagers mature, and thus energy requirements do as well. The amount of energy required by the body to function is defined as BMR. Among these functions are blood pumping by the heart, respiration, kidney function, and maintaining muscle tone and body temperature. BMR is directly related to the amount of lean body muscle mass, size, and gender. Physical activity, particularly weight-training exercises, is essential for increasing and maintaining lean body mass. At the start of adulthood, it is important to reduce one's energy intake while also ensuring that all nutritional needs are met. This can be accomplished by consuming an adequate amount of energy (which varies depending on body weight, level of

physical fitness, and muscle vs. body fat) and adjusting this amount of energy to one's level of physical activity. Energy-producing foods must be highly nutritious, with a high concentration of essential nutrients such as vitamins, minerals, and essential proteins (James, 2004).

Obesity is almost the result of consuming more energy (food) than is needed for daily living. Excess energy is stored as fat and can only be burned off by expelling more energy than is consumed (excluding the surgical removal of fat). Fat can be accumulated slowly or quickly. Once fat is stored, eating only enough to balance energy output each day will leave accumulated fat unchanged. Obesity is frequently seen in families, and it is not always clear whether the cause is genetic or cultural. Obesity develops when the body's fat stores are overburdened. It should not be confused with a high body weight caused by bulky muscles or an abundance of body water. Obesity can cause physical and psychological harm, as well as a reduction in life expectancy. Diabetes mellitus is one of the most serious medical conditions associated with obesity. Because so many of the problems associated with obesity limit mobility, sometimes severely, the exercise option for aiding weight loss is often ineffective, implying that food intake must be reduced more than in more mobile subjects. Obese people are typically very inactive, with fidgeting almost non-existent. Obese people require relatively little food due to their physical inactivity and better heat insulation (Wiseman, 2002).

All known weight-control apparatuses cannot explain the remarkable body weight control that has existed for many years. None of them appear likely to adjust energy intake precisely enough to prevent a daily excess of 50 kcal from being consumed, despite the fact that such an excess would cause severe obesity over time unless a previously unknown and extremely delicate controlling system was present. It has been proposed that excess food can be burned off by special cells (known as brown fat) in order to maintain body weight stability, and that obese people may be deficient in this regard. Although this mechanism, known as diet-induced thermogenesis (DIT), may exist in some animals, it does not appear to be significant in humans (Wiseman, 2002).

Many people are able to match their energy intake and output in order to maintain nearly the same weight over long periods of time, but some appear to be unable to do so. It is unknown whether being overweight is primarily an inherited trait, but it is possible. Being moderately overweight has survival value because it allows energy to be stored when food is abundant as a preventative measure against starvation when food is rare. Only in wealthy societies does moderate obesity become unnecessary (Wiseman, 2002).

Given known individual differences in biochemistry and metabolism, a "one diet fits all" approach is usually ineffective, according to Priya and Joseph (2008). In general, the basic approach to weight loss is to reduce total energy intake by 2000–4000 kilojoules per day (approximately 500–1000 calories) while consuming adequate protein, carbohydrate, essential fats, and other nutrients. The sport's demands, the intensity, frequency, and duration of training, as well as an individual's physical size, must all be considered. It can be difficult to strike a balance between reducing energy intake and meeting training nutritional requirements (Priya & Joseph, 2008).

2.2.6. Basic Nutrition Standards and Guidelines

Most dietary recommendations, such as getting adequate nutrients within calorie needs and eating fiber-rich fruits, vegetables, and whole grains to meet carbohydrate needs, are applicable (Dunford & Doyle, 2007).

According to the Departments of Health and Human Services and Agriculture's Dietary Guidelines for Americans (2005), which are published every five years, the Dietary Guidelines' goal is to provide Americans over the age of two with dietary and exercise advice that will promote health and lower the risk of chronic diseases. People who want to improve their health and fitness should start with the Dietary Guidelines. The general nutrition principles can then be tailored to the specific needs of training (Dunford & Doyle, 2007).

The release of the 2005 Dietary Guidelines resulted in an update to the Food Guide Pyramid graphic shown in Appendix 6. This graphic, now known as MyPyramid, reflects the principles outlined in the Dietary Guidelines and serves as a food guidance system that can be used to orient consumers about basic nutrition.

According to Dunford and Doyle (2007), MyPyramid is intended to convey a number of general messages, including physical activity, variety, proportionality, moderation, gradual improvement, and personalization. A figure climbing steps represents physical activity, which was not included in the original Food Guide Pyramid. This is a representation of the importance of physical activity on a daily basis. Each of the colored bands represents a different food group, representing variety. The width of the band indicates how much food should be selected from that group in relation to the other groups.

2.2.7. Methods of Eating Habits Assessment

Planning an effective nutrition intervention for a specific population sample necessitates identifying its nutritional problems and primary needs. Traditional dietary assessment methods assess both short-term and long-term dietary intake, such as 24-hour recall and food records, as well as food frequency questionnaires and dietary histories (Bingham, 1987, 1991).

These methods have some limitations that limit their use in dietary surveys (Kristall et al., 1990; Bingham, 1991; Birkett & Boulet, 1995; Yaroch et al., 2000), although they were widely used in the last 50–60 years (Bingham, 1991), because most of them are not always suitable due to cost, response burden, bias, and the need for highly trained staff for administration (Yaroch et al., 2000).

Semi-quantitative food frequency questionnaires have been the most commonly used methods in nutritional epidemiological surveys in recent years. In fact, when compared to other traditional methods for assessing dietary intake, they are brief, inexpensive, simple to administer, and less burdensome (Yaroch et al., 2000). Nonetheless, the aforementioned questionnaires are designed to measure dietary energy and nutrient intake and do not investigate other aspects of nutrition such as food habits and eating behavior, both of which are related to nutrition and food safety. All of these factors are critical in a nutritional surveillance program. Other questionnaires, structured with scores and scale scores, have been developed in the last ten years to investigate some of the aforementioned aspects (Kristall et al., 1990; Williams et al., 1993; Birkett & Boulet, 1995; Vandongen et al., 1995; Johansson et al., 1997; Sapp & Jensen, 1997; Parmenter & Wardle, 1999; Hu et al., 1999; Yaroch et al., 2000). It is well documented that each questionnaire must be tested for reliability before being used in large-scale studies.

The last nutrition questionnaires mentioned above have limitations because they cover only a limited area of nutrition knowledge (Towler & Shepherd, 1990; Steenhuis et al., 1996; Resnicow et al., 1997), and were not subjected to rigorous validation (Andersson et al., 1988), or were designed for adults and may not be appropriate for use with an adolescent sample (Resnicow et al., 1997; Sapp & Jensen, 1997).

Traditional dietary assessment methods are not always appropriate for obtaining information on eating behaviors and assessing the impact of a nutrition education program, whereas the current Italian questionnaire developed by Turconi et al. in 2003 and used in this study can measure the effects of nutrition interventions on students due to its consistency in making comparisons over time. The instrument is inexpensive and simple to administer and analyze. Furthermore, it could be appropriately modified to meet the needs of other populations as well. The questionnaire had nine major sections and was self-administered.

This instrument has been standardized among university students by the authors. This survey's reliability is acceptable, with a Cronbach's alpha ranging from 0.55 to 0.75. With $p=0.01$, all Pearson correlation coefficients are statistically significant (Turconi et al., 2003).

2.3. BODY COMPOSITION

2.3.1. Terms, Definitions, Background Information

Body composition refers to all of the components that comprise the body. The human body is made up of an incredible number of different types of cells and materials. Due to the variety of these types, they are frequently grouped into more general categories for study and discussion. Body composition is frequently subdivided into the broad categories of fat mass (FM) and fat-free mass (FFM) in the fields of exercise physiology and sports nutrition. Fat mass is the total amount of fat in the body, whereas fat-free mass is the total amount of nonfat tissue in the body, with skeletal muscle being the most prominent nonfat tissue. Fat-Free Mass is exactly what it sounds like: all of your body's mass that is not attributed to fat, including skeletal muscle mass. Everything that is not fat can be classified as Fat Free Mass (InBody, 2018).

The specific components of body tissues—total body mass (weight), body fat (fat mass), muscle mass, bone mass and density, and fluids—are of primary importance (Dunford & Doyle, 2007).

Body composition and weight have been linked to performance, appearance, and health. Body composition, particularly the proportion of muscle mass, has the potential to improve exercise and performance (Dunford & Doyle, 2007).

The human body is composed of different structural elements called tissues. Cells produce tissues and atoms produce cells. These structural elements make the human body a living organism (Wang et al., 2000; Wang et al., 2004).

Changes in one component, however, have an impact on changes in another (for example, percent of body fat mass - PBFM - and percent of fat free mass - FFM). This enables a better understanding of the biology of human body composition and, as a result, improved control of human health (Despres & Lamarche, 1993; Ellis, 2000; Kukic & Dopsaj, 2017).

According to Wang et al. (1992), nutritional status, level of physical activity, and disease state all have an impact on body cell mass, which can then be used as a biomarker for these changes. As a result, certain biological laws control the nature of the human body, and any interruption of these laws requires adaptation, which is frequently established and build on changes in body composition (Ilic, 2006). For example, energy obtained from food, and a certain quantity of physical activity is needed for a person's body to to function properly. When this person reduces his physical activity to a low level, and in the same time consumes a higher amount of food than necessary, the body adaptation will be in the form of storing fat and therefore, increasing the body weight (Kukic & Dopsaj, 2017). If, on the other hand, a person engages regulatly in scheduled resistance or cardio training program accompanied with balanced food, the body will adapt to that regime in an obvious decrease in BFM and increase in SMM (Demling & DeSanti, 2000; Ilic et al., 2012; Stankovic et al., 2013; Stojkovic et al., 2017). Excess body fat, particularly fat accumulated deep in the abdominal cavity, may impact the onset or progression of chronic diseases, as well as long-term health (Dunford & Doyle, 2007).

In other words, it is widely accepted that body composition is influenced by a variety of factors such as diet, stress, physical activity level, and other aspects of daily life (Demling & DeSanti, 2000; Ng et al., 2011; Ng et al., 2012; Kukic & Dopsaj, 2017).

As a result, body composition measurement is an important screening method that can be used to control a person's current nutritional and health status.

2.3.2. Basic Body Components

2.3.2.1. Skeletal Muscles

In common parlance, the terms muscle mass and lean body mass are interchanged (e.g., strength training results in an increase in lean body mass LBM), but muscle is only one component of lean body mass. The majority of body composition discussions center on body fat and muscle mass (Dunford and Doyle, 2007).

The most sizeable tissues in the human body are the skeletal muscles (Janssen et al., 2004; Alvar et al., 2017). These muscles are linked to the bones and allow for movement. They can be grown and developed through exercise (e.g., biceps, pectorals, quadriceps, etc) (InBody, 2018). Aproximately forty percent of total human body mass is formed by skeletal muscle mass (SMM) in males, and thirty two percent in females. Skeletal muscle mass is the most significant element involved in movement, health of bones, respiration, and glucose stability (Ilic, 2006; Alvar et al., 2017). Due to the impact of protein structure within them, skeletal muscles are considered the principal movers since they are the only living tissue in comparison to fat and bone tissue (Ilic, 2006; Alvar et al., 2017). According to Alvar et al. (2017), each skeletal muscle has four main characteristics: contractility (producing strength through shortening and force production), excitability (reactions to the impulses of the central nervous system (CNS)), extensibility (extensible tissue fibers that allows flexibility), and elasticity (The ability to stretch a muscle to its full range of motion without restriction and return to its normal length) (Stankovic et al., 2013; Alvar et al., 2017).

Dopsaj et al. (2015) discovered that men had more protein mass (PM) relative to body weight than women (17.22% vs. 14.94%, p 0.001) and lower relative amounts of fats (13.53% vs. 24.28%, p 0.001). Dopsaj and Orevi-Niki (2016) found similar results in Serbian proficient athletes, with women athletes having significantly lower relative amounts of PM (15.93% vs. 17.73%, p 0.001) and SMM (44.98 percent vs. 51.06 percent, p 0.001), but higher amounts of PBFM (19.54% vs. 11.01%, p 0.001).

2.3.2.2. Body Fats

Body fat is required for the body to function because it, among other things, allows the body to store energy, protect internal organs, acts as an insulator, and regulates body temperature. Nobody can have 0% body fat, and keeping body fat percentages below 4% is generally considered unhealthy for long-term health (InBody, 2018).

According to Wang et al. (1992), fats is a synonym for chemical compounds that form three fatty acids and glycerol, and these chemical compounds form Triglycerides.

Despite their differences, lipids and triglycerides or fats are frequently used interchangeably. Fats, along with compound lipids, steroids, fatty acids, and terpenes, are thus a subcategory of lipids. Furthermore, lipids are divided into two categories: essential lipids, which account for 10% of total lipids, and nonessential or storage lipids, which account for the remaining 90% of total lipids. Furthermore, non-essential lipids are known as fats or adipose tissue (Wang et al., 1992), which has been linked to poor health (Stevens et al., 1998; Ardern et al., 2003; Charles et al., 2008). Excessive BFM raises the risk of cardiovascular disease, high blood pressure, diabetes, and, according to some studies, mortality (Stevens et al., 1998; Ardern et al., 2003; Violanti et al., 2009; Gu et al., 2012; Garbarino & Magnavita, 2015).

BF, PBFM, and FT, like measures of muscularity, represent absolute amounts of fat, which means that fatness of a larger person may be overestimated if body height is not taken into account. Furthermore, the fatness of a smaller person may be misjudged. The PBFM standards were created so that people of various sizes, genders, and ages could estimate their fat mass relatively precisely (Riebe et al., 2018). In order to develop more specific body fatness indicators, scientists have started to establish and develop body composition indexes (de Oliveira et al., 2016; Kukic & Dopsaj, 2017; Kukic et al., 2018; Kyle et al., 2003). Body fat mass index (BFMI), skeletal muscle mass index (SMMI), protein fat index (PFI), muscle fat index (MFI), index of Hypokinesia (IH), and so on are known as the newly developed indexes which affect the body composition structure (Kukic & Dopsaj, 2017).

2.3.3. Methods of Body Composition Assessment

Based of its biological significance in indicating healthy physical body status, body composition has been inspected extensively recently through new developed assessment approaches (Wang et al., 1992; Ellis, 2000). The first traditionally used approaches to measure body density and total body water is known as underwater weighing or (densitometry) and isotope dilution. These approaches delivers scientific results through the classic two-compartment model that splits body weight into body fat mass BFM and fat free mass FFM. New branded technological developments have established important technical improvements in measuring body composition on both theoretical and practical levels. The Hydrostatic weighing method which is also known as underwater weighing works by calculating the person's body fat percentage in underwater settings. This technique is used as follows: the participant must first expel all of the air from lungs before dipping in a pool while sitting on a special scale device. Your underwater weight is compared to what you weigh on land, and these figures, along with the density of the water in the pool, are subjected to a series of calculations. Your body fat percentage is calculated as a result of these calculations (Wang et al., 1992; Hu, 2008; Riebe et al., 2018; InBody, 2018).

Anthropometric measurements, which are the most common, least complicated, and least expensive, include assessments of body height BH, combined with body mass BM, waist circumference WC, and other anthropometric measurements (Hu, 2008). Dietary status is estimated using the body mass index (BMI), which is calculated as

BM/(m^2) and is one of the most commonly used variables in epidemiology research (Hu, 2008; Riebe et al., 2018).

Another widely used method of measuring body composition is the skinfold measurement method. This method calculates the thickness of several skin bends throughout the body to estimate body fat dispersal (Hu, 2008; Riebe et al., 2018). Skinfold calipers measure the amount of skinfold that can be grasped by the caliper's arms by pinching external body fat in various locations around your body. These results are collected and used in mathematical calculations to determine your total body fat mass. The amount of hypodermic fat in the body is proportional to one-third of total body fat. This is used as a standard in skinfold measurements. Skinfold measurements, however, are more vulnerable to subjectivity and inter-observer variability. Moreover, it is classified as less reproducible compared to other anthropometric methods such as height, weight, and body circumferences (Hu, 2008; Riebe et al., 2018; InBody, 2018).

Although the majority of other body composition approaches are laboratory based tests that are characterized by more accuracy, they are unaffordable, expensive, and time wasting. These methods encompass the following: Densitometry, air displacement plethysmography (ADP), in addition to dual-energy x-ray absorptiometry (DXA), and multifrequency bioelectrical impedance analysis (BIA) (Dimitrijevic et al., 2013; Dopsaj & Vukovic, 2015; Kukic & Dopsaj, 2016, 2017). The Bioelectrical Impedance Analysis (BIA) works by passing a small electrical current through a person and measuring the resistance (impedance) of that current as it travels through the body's water. Once impedence is measured, body composition is calculated. In contrast to other measurement methods, a technician is rarely required to be present when conducting the BIA test. BIA devices are simple to use; simply follow the instructions on the device (InBody, 2018).

The main advantage of the BIA analysis is that it provides body composition data such as SMM, BFM, PBFM, PM, FFM, total body water (TBW), mineral mass, and intracellular water (ICW), to name a few (Wang et al., 1992; Ellis, 2000). Over the last 15 years, single frequency, simpler systems have gradually been replaced by multi-segmental and multi-frequency analysis, with more multifaceted approaches for assessing body fat, FFM, body water, skeletal muscle, and water distribution (Hu, 2008), which have demonstrated greater accuracy (Lee et al., 2017). The multi-segmental body composition approach assumes that the human body is made up of a series of cylinders (the left and right legs, the left and right arms, and the entire body are all measured) (Lee & Gallagher, 2008). Multifrequency BIA separates TBW into intracellular water (ICW) and extracellular water (ECW) compartments, which is useful for describing fluid shifts and fluid equilibrium, as well as investigating variations in hydration levels (Lee & Gallagher, 2008). The use of multi-segmental and multifrequency BIA could be emphasized for a number of reasons, including the fact that the equipment is relatively inexpensive, user friendly, easy to transport, and considered a quick relatively excellent choice for pitch studies of various sizes. The major limitation of this assessment model is that all measurements must be performed in accordance with a specific procedure, which necessitates that food consumption and hydration be controlled prior to the measurements (Hu, 2008).

2.4. ANALYSIS OF PREVIOUS RESEARCH

Obesity and weight gain have been linked to a variety of factors. Skipping breakfast, as well as low vegetable and fruit consumption have been associated to a higher body mass index (Tohill et al., 2004; Lin & Morrison 2002; Cho et al., 2003). Literature have confirmed that low calcium consumers have higher percentage of body fat, or body mass index. In addition, stable and controlled body weight over a time is linked with a pattern of consuming low-fat milk products (Zemel et al., 2000; Jacqmain et al., 2003; Drapeau, 2004). Furthermore, specific life phases that are more likely to influence lifestyle and thus body weight are identified in the literature (Pullman et al., 2009; Crombie et al., 2009). As a result, lifestyle consequences such as weight gain, physical activity reduction, and sedentarianism, but not dietary intake is associated with the "Freshman" phase which is also known as switching from high school to university (Pullman et al., 2009). This time period may favor unhealthy behaviors such as frequent snacking and consuming nutrients of low value. The wide prevalence of weight gain and obesity determinants caused by unhealthy food consumption, reduction of physical activity, and other critical health behaviors call for a health promotion strategy and obesity prevention interventions in the population (Crombie et al., 2009).

The majority of mediations developed for controlling and preventing overweight and obesity are being implemented in specific workplaces and in educational institutions (Katz, 2005). After one year of implementing a students' health- promotion program established and evaluated by a Canadian university, a significant development in body-weight composition, lipid status, and prevention of weight-gain have been determined (Hivert et al., 2007).

Overweight has been highly detected in university settings. American freshmen students have encountered a 1.75 kg average weight gain in there studying stages (Vella-Zarb et al., 2009). According to European literature, first year university students in Belgium have increased significantly their body weight (1 kg), body mass index (BMI; 0.3 kg/m^2), and percentage of body fat (0.8%) after only one semester at university (Deliens et al., 2015).

When inspecting body composition structure at the molecular level, several constituents can be seen such as lipids, proteins, glycogyn, and water (Wang et al., 1992). There must be a balance in the consumption of these constituents found in different proportions in food consumed by people, or else, the relationship and equilibrium between them will be negatively changed (Despres & Lamarche, 1993). This disparity between constituents, pooled with changeable levels of physical activity and age, primarily leads to the process of fat mass increasing and muscle mass decreasing (Despres & Lamarche, 1993; Kukic & Dopsaj, 2016).

It has been proven that stress, diet, PA level, and other day-to-day behaviors impact the structure of body composition (Kukic & Dopsaj, 2017). In Abu Dhabi workforce setting, a field research has been conducted by Kukic & Dopsaj (2017) for the purpose of determining the factorial structure of body composition in police officers. The study revealed that body composition structure is affected by three (3) independent factors

Factor 1 – Physical Inactivity and Nutrition, Factor 2 – Physical Inactivity and Exercise, and Factor 3 – Sedentary Lifestyle.

Previous research has linked the consumption of sugar-sweetened beverages and fast food to weight gain and obesity (Malik et al., 2006; Bachman et al., 2006).

Anderson et al. (1988) also reported that spending more time in watching TV, accessing video games, and working on computers, and absence of PA have raised the popularity of overweight kids in the US. It is possible to draw the conclusion that physical activity and dietary habits have a very strong relationship between body size and volume independent of fat and muscle components. Physical inactivity results in an excess of unutilized energy being stored as fat tissue. Muscle tissue development, on the other hand, is a result of increased physical activity.

Park et al. (2014) anticipated reference percentile values for the major body composition variables in Korean children and adolescents utilizing the dual-energy x-ray absorption technique. The following measures were demonstrated by university-age students: Males have a BMI of 22.63, while females have a BMI of 21.33. Males have a PBFM of 19.86 and females have a PBFM of 32.15. Males have an FMI of 4.62 and females have an FMI of 6.92.

Doder et al. (2021) assessed the physical activity levels of Bosnian University students by providing preliminary IPAQ scores among Sarajevo University students and comparing them by gender. According to the findings, the majority of the student population participates in moderate activities on a weekly and daily basis. Male students had higher values in all variables representing physical activity, while female students had higher values in sitting hours.

These issues have also been thoroughly discussed in comparative studies. Lopez-Sanchez et al. (2019) investigated the differences in body composition, physical fitness, and lifestyle behaviors between Polish and Spanish Sports Sciences students. The differences in body composition, physical fitness, and lifestyle behaviors have been analysed by the authors who concluded that Spanish students had a healthier lifestyle (Walking (days/week) 5.32 ± 2.23, MPA (days/week) 3.98 ± 1.93, Seafood/week 2.07 ± 1.19, Fruits/day 1.96 ± 1.23 , Dairy products/week 7.54 ± 5.37), while Polish students had better mean values of body composition and physical fitness (Body Composition: BMI (kg/m^2) 24.17± 3.18, FFM (kg) 67.11 ± 7.13, BMR (kcal) 1995.03 ± 232.31).

Polish students (University of Gdansk) had higher FFM (kg), higher TBW (kg), higher BMR, and more consumption of vegetables and liquids than Spanish students (University of Murcia). Spanish students engaged in more physical activity and consumed more seafood, dairy products, less sugary drinks, less alcohol, and less tobacco than Polish students.

In a correlation analysis, the three lifestyle variables with the greatest influence on body composition and physical fitness were: weekly VPA minutes (positive influence in 12 variables), daily vegetable consumption (positive influence in 14 variables), and daily liquid consumption (positive influence in eight variables) (Lopez-Sanchez et al., 2019).

In examining Central Michigan University students' weight, PA, and nutritional patters and beliefs, Yahia et al., (2016) concluded that 78 percent of females were having a healthy weight, paralleled to 52 percent of males, and less than one-third (29.0 percent) were classified as overweight or obese. The majority of students had 'satisfactory' dietary habits. According to the physical activity and lifestyle scores, most students were inactive. A mild proportion of them (7%) reported having a very active lifestyle, and only (4%) had an acceptable understanding of nutrition.

A Canadian study (Lachance et al., 2010) assessed lifestyle factors and other health measures in a Canadian university community and discovered that 22.9 percent of students and 37.3 percent of workforce members are either overweight or obese. In both groups, most of sample participants were not consuming the required quantity of fish, fruits, and vegies. On the other hand, they were not participating in acceptable levels of physical activity.

A Serbian study conducted by Dopsaj et al. (2015) in the settings of the University of Belgrade and in participation of the sport and physical education students, discovered that the most male and female students (87-90%) have a normal percentage of body fat, because they were involved in an excessive physical activity schedule and therefore considered physically active. The study provided preliminary data for future research and investigation into the relationship between physical activity, nutritional status, and health amongst college scholars. Because the respondents are physically active young people, the study's findings revealed that 65-70% of studens have normal body mass index, and 87-90% of them have normal percentage of body fat, because these scholars meet the WHO physical activity recommendations with (149 to 231 minutes per week).

In the same theme, another recent Serbian study (Kljajevic et al., 2021) conducted a systematic review with an electronic database search. After analyzing the findings of 21 studies involving 7306 male and female participants, it was possible to conclude that university scholars demonstrated an acceptable level of fitness and physical activity. However, the outcomes vary due to a variety of factors, the majority of which are attributed to differences in cultures of students' backgrounds as well as the diversity of educational systems worldwide.

Loginov et al., (2021) compared the intensity levels and PA domains of Surgut State University (Russia) students of various ages to their European peers on a gender and age-specific basis. The reported weekend sitting time of Polish, Hungarian, Czech, and Slovakian students was noticeably lower than that of Russian students. The researchers concluded that physical activity among Russian students was insufficient for both gender groups.

Martins et al., (2021) sought to relate and characterize physical activity (PA), eating habits (EH), and quality of life (QOL) in Portuguese children and youth, as well as investigate the effects of gender, age, and BMI. Lower BMI was associated with better (EH) (p 0.001), PA (p 0.05), and self-esteem (p 0.01) and worse scores on the family subscale of the (QOL). Females consumed more fruit (p 0.05). The older has outperformed the younger. PA has a positive relationship with QOL (p 0.01) and EH (p 0.05). Finally, gender had no effect on the PA or quality of life. In fruit consumption, it

has been noriced that females consume more fruits than their male colleagues, possibly indicating more feminine concern with the role of fruit in the diet.

To the best of our knowledge, only three Lebanese studies concentrated on the lifestyle of university students majoring in sport and health science, including their level of physical activity and diet. The first study conducted at Beirut Arab University (Assaf et al., 2019) found that 82 percent of students do not follow a specific diet, do not consider their food choices to be healthy, and would like to take better care of their health. This is primarily due to the fact that they do not exercise as frequently as they would like. According to the findings, 15% of students were sedentary, 52% were moderately active, and 33% were very active; 52% usually exercise while 48% do not; 9% were underweight and 16% were overweight, , 32% were borderline, and 43% were healthy weight.

The second Lebanese study (Yahia et al., 2008) conducted at the Lebanese American University in Beirut found that most of Lebanese students (64.7%) were having normal weight (49% male students compared to 76.8% female students). Male students were more likely to be overweight or obese than female students (37.5% and 12.5% vs. 13.6%and 3.2%, respectively). The majority (61.4%) reported eating meals on a regular basis with reference to the students' eating habits (Yahia et al., 2008).

Fayyad and Dopsaj, (2021) conducted the third Lebanese study, which generated primary data and described the patterns of students' lifestyle behaviors emphasizing on physical activity prevalence among Lebanese college students. Six hundred students (346 males, 254 females, mean age 23.53) were randomely selected from 20 Lebanese universities. The authors used the International Physical Activity Questionnaire (IPAQ) to assess overall physical activity levels across four lifestyle domains: work, transportation, home and gardening, and leisure-time, and presented the results in metabolic equivalent-min per week (MET-min/week).

According to the findings, 22% of students had a high level of physical activity, 61% had a moderate level, and 17% had a low level. According to activity intensity, 47 percent (n= 282) of students' physical activity were classified as vigorous, 45.2 percent (n= 271) as moderate, and 68.3 percent (n=410) as light or walking activities. The average daily sitting time for the entire sample was 6.23 hours. Males had a weekly total physical activity level of 2970.5 MET-min/week and females had a weekly total physical activity level of 2719.5 MET-min/week.

As a synthesis of the above previous studies findings regarding university students' lifestyle factors, it can be concluded that male university students were more active than females in all physical activity domains. The majority of university students were classified with moderate physical activity level. The majority of them were found in normal body weight while the prevalence of overweight and obesity cases were more common among males compared to females. Physical Inactivity and unhealthy dietary patterns carried significant impact on Body composition. Lifestyle variables like consumption of vegetables per day, minutes of VPA per week, and consumption of liquids per day were determined with the utmost impact on students' body composition and physical fitness. Finally, most participants did not meet the recommendations for vegetables and fruits, knowing that females consumed more fruit and vegies than males.

3. PROBLEM, PURPOSE, AIMS, TASKS, AND SIGNIFICANCE OF THE STUDY

3.1. DEFINING THE PROBLEM

In general, university students encounter a number of critical challenges when adjusting to a new environment. This environment, which includes the severe negative effects of study stress, time management troubles, and hectic class schedules, contributes to a concerning health unawareness. Adopting to this new environment has consequences such as decreased physical activity levels, unhealthy eating patterns, tobacco use, excessive alcohol consumption, fewer hours of sleep, and increased levels of stress. Sedentary lifestyle unhealthy behaviors were discovered to be common among young adults, exposing them to serious health concerns such as obesity, type 2 diabetes, cardiovascular disease (CVD), hypertension, and other public health concerns that lead to the risk of chronic noncommunicable diseases and mortality.

3.2. PURPOSE OF THE STUDY

The purpose of the study is to examine the relationships between the two most important factors of quality of life, such as physical activity and dietary (eating) habits, and to determine their impact on body composition, and all in relation to student specialty and gender characteristics among Lebanese universities' students.

3.3. AIMS OF THE STUDY

This study includes the following aims:

- Determining the Physical Activity, Eating Habits, and Body composition profiles among Lebanese universities' students;
- Comparing these profiles between students of Physical Education and Sport sciences, and students from another specialities;
- Comparing these profiles among genders of the studied sample;
- Establishing a clear statistical analysis from the above compared samples' profiles to determine the desctiprives, correlations, and differences between the variables of lifestyle factors;
- Creating optimal model of behavior towards Physical Education and Eating Habits for Lebanese students according to gender to be implemented as a strategic education policy for future.

3.4. TASKS OF THE STUDY

The tasks of this study are as follows:

- Defining the Physical Activity Levels by continuous and categorical scores;

- Defining the Eating habits Patterns;
- Defining the body composition profiles;
- Defining the groups of participants and their characteristics;
- Collecting the data of the sample groups;
- Analyzing data using specialized software for statistical analysis, SPSS;
- Describing the analyzed variables, and interpreting the results;
- Create optimal model for Physical Activity and Eating Habits behavior for Lebanese students.

3.5. SIGNIFICANCE OF THE STUDY

The significance of the study can be recognized in relation to the following three

Outcomes:

- Create an actual model for Body Composition, Physical Activity and Eating Habits for Lebanese Universities' students of both genders;
- Develop specific recommendations on health promotion to provide to students when transitioning to university;
- Develop tailored interventions and programs aimed at improving youth students' wellness and lifestyle behavior.

4. HYPOTHESES

The defined general hypothesis is –

HG - Eating habits and physical activity are independent factors that statistically significantly affect the quality of body composition in Lebanese university students.

The supporting hypotheses are defined as follow -

H_1 – Students from Faculties of Physical Education and Sports Sciences have better dietary habits, higher levels of physical Activity, and better body composition than students of other university specialisms.

H_2 – Students of Physical Education and Sports Sciences meet the International standards of physical activity levels.

H_3 – Students of other University specialisms do not meet the International standards of physical activity levels.

H_4 – There are significant differences in the means of levels of Physical Activity and Body Composition between female students of Physical Education and Sports Sciences and other University specialisms.

H_5– There are significant differences in the means of levels of Physical Activity and Body Composition between male students of Physical Education and Sports Sciences and other University specialisms.

H_6 – Physical Activity has stronger influence on Body Composition than Dietary Habits independent on gender.

5. METHODS

5.1. DESIGN OF THE STUDY

This research is an Applied Deductive Quantitative Research - Cross-sectional Descriptive study.

5.2. SAMPLE CHARACTERISTICS

In this dissertation, it was planned to recruit 600 students (300 males, 300 females) representing more than eight Lebanese universities specialized in both sport or health sciences majors, and non-sport or health sciences majors, in order to have as more representative sample as we could. Unfortunately, and due to the continuity of Covid-19 consequences and the health measures taken by the government and the official educational system in Lebanon during the academic year 2020-2021, all Lebanese universities have turned to the online learning system. Final exams for these universities' students were conducted online from their homes except the Lebanese university students who attended personally to do written exams at the faculties' classrooms. Therefore, and since we have to conduct direct and personal body composition tests for our targeted students using the bio-electric impedance analysis method, our sample had been recruited from the Lebanese university, faculty of education from its two branches, where the researcher attended and conducted a body composition analysis (BCA) for the physical education and sport students as well as students of other educational majors according to the study sample. The BCA tests have been done after the concerned students having filled-out the online google-form research questionnaire including both physical activity and nutrition assessments.

Based on the previous information, and since reducing the sample is necessary, the author had used (Qualtrics Experience Management, 2021), a statistical calculator based on a reference technique for sample size. There are nearly 180850 Lebanese university students distributed over 38 public and private universities (Yacoub & Badre, 2012). In such a population, and based on the Qualtrics Experience Management technique, a sample of 384 participants is judged representative at the 95 percent confidence level, with a standard margin of error of 5%. Therefore, the study sample consisted of 384 Lebanese university students divided as follows: Two hundred (200) sportive students, males (n= 100) and females (n=100) recruited from the faculty of education, physical education and sport major at the Lebanese university, in addition, 184 students males (n= 70) and females (n= 114) were recruited from non- sport majors of the same faculty.

Participants were in college age, and the inclusion criteria were being regular full-time students attending in the three Bachelor's academic years of the academic programme. Exclusion criteria were having any chronic disease, serious injury, or disability that does not allow participation in body composition tests. Students were recruited randomly, via classroom (Physical Education and Sport Classes), and other specialisms through student affairs offices assistance.

5.3. DATA COLLECTION AND TESTING PROCEDURES

Two steps were applied to collect relevant data. First of all, students had to fill out the Physical Activity and Eating Habits questionnaires, then they had to complete the anthropometric and body composition measurements.

Step 1- For Physical Activity and Eating Habits assessments: a self - reported questionnaire has been applied through the Google Forms platform, ensuring confidentiality and anonymity at all times. This instrument allowed us to collect data regarding the actions, opinions and thoughts of the surveyed participants. The link to the referred questionnaire has been shared via different electronic applications, social networks and email addresses of the surveyed students. Online form platform surveys were familiar to the author who used them in his cross-sectional descriptive previous studies shown in appendices 2 and 3, (Fayyad et al., 2020) and (Fayyad & Dopsaj, 2021), to survey Lebanese samples for different research purposes.

Step 2- After questionnaires being filled out, body composition measurements had been performed. Variables (Dopsaj et al., 2015; Dopsaj et al., 2017) such as body weight, body fat and percentage body fat, skeletal muscle mass and percentage of skeletal muscle mass, body mass index, index of hypokinesia, body fat mass index, total body water, Skeletal muscle mass index, muscle fat index, measurements had been determined using InBody 270 (Biospace Co. Ltd, Seoul, Korea). The body height was measured using a fixed stadiometer in accordance with the standard protocol. BMI was calculated by dividing weight (Kg) by height (m^2). The subjects then stood on the scale with their bare feet and hands on the marked areas to perform the body composition measurements listed above. To be as accurate as possible, the students were instructed not to eat or drink anything for at least 3 hours prior to the measurement.

Body mass had been measured to the nearest 0.1 kg with the subjects dressed in light clothing. Barefoot, standing height had been measured to the nearest 0.5 cm with a wall-mounted stadiometer.

This study's participants volunteered to take part. Agreeing to participate in this study, participants were asked to sign a consent form, carried out by having them answer a question at the start of the questionnaire confirming their participation. Students were also assured that the information gathered would be kept confidential and used exclusively for scientific purposes.

The data have been collected during the 2021. The research protocol was recognized in the Declaration of Helsinki (World Medical Association, 2013) and it was approved by the Ethical Committee of The Faculty of Sports and Physical Education in the University of Belgrade under the number of 484–2. Appendix 1 included the study Ethical Approval.

5.3.1. Physical Activity

Participants had to complete the self-administered extended form English version of IPAQ (International Physical Activity Questionnaire) (Appendix 7) containing 27 questions covering four (4) domains of physical activity (work- related physical activity, transport-related physical activity, domestic (housework) and gardening (yard) activities, leisure time physical activity), along with the time spent sitting. All questions refer to the previous 7 days. Overall, the IPAQ questionnaires produced repeatable data (Spearman's clustered around 0.8), with comparable data from short and long forms. Criterion validity had a median of about 0.30, which was comparable to most other self-report validation studies. The "usual week" and "last 7 d" reference periods performed similarly, and the reliability of telephone administration was similar to the self-administered mode. The IPAQ instruments have acceptable measurement properties, at least as good as other established self-reports. Considering the diverse samples in this study, IPAQ has reasonable measurement properties for monitoring population levels of physical activity among 18- to 65-yr-old adults in diverse settings (Craig et al., 2003).

For IPAQ continuous score, each domain of physical activity was expressed in three energy dimensions: vigorous, moderate, walking. The results were presented as the estimation of energy expenditure in metabolic equivalent-minutes per week (MET minutes/week). The total physical activity was calculated by estimating the data in MET-min./week in particular domains, multiplying the duration in minutes by the number of days and the corresponding intensity factor: walking - 3.3, moderate - 4.0, vigorous - 8.0. The prevalence of physical activity was calculated as the percentage of students involved in the activity.

For IPAQ categorical score, the study sample was categorized into three levels of physical activity: "high" "moderate" and "low" (physically inactive). The standard scoring criteria were as follows: 1) High: Meets either of two criteria: (a) VPA on > 3 days/week and accumulating at least 1500 MET-minutes/week; or (b) >5 days of any combination of walking, MPA, or VPA activities achieving at least 3000 MET-minutes/week. 2) Moderate: Meets any of the following three criteria: (a) 3 days of VPA of at least 20 minutes/day, (b) 5 days of MPA activity or walking of > 30 minutes/day for > 10 minutes at a time; or (c) 5 days of any combination of walking, MPA or VPA activities achieving at least 600 MET-minutes/weeks. 3) Low: Meets neither 'moderate' nor 'high' criteria (IPAQ Scoring Protocol, 2005).

5.3.2. Eating Habits

The researcher has used an adopted form of a standardized questionnaire (Appendix 8) utilized formerly in the study of Turconi et al. (2003).

In this research, the author used (43) items out of (99), and five (5) sections out of nine (9) covering the main nutritional aspects and sub-topics including frequency of food consumption, food habits, physical activity and lifestyle, students' dietary beliefs, and nutrition knowledge. Eleven questions have been added before section 1 to cover the socio-demographic personal data. These data included: Gender, date of birth, place of birth, place of living during the last five years, Major of study, Academic Year, Mother's

level of education, Father's level of education, marital status, number of children, and professional status (Employed/Unemployed).

Section 1, frequency of food consumption, included 10 questions and was assessed by evaluating the frequency of consuming healthy and unhealthy food. Section 2, food habits, included 13 question and was assessed by a score assigned to each response, which ranges from 1 to 4, with the maximum score assigned to the healthiest one and the minimum score to the least healthy one. The total score of this section was 52. For Section 3, Physical Activity and Lifestyle, it contains 6 questions and each score ranges from 1 to 4, with the maximum score assigned to the healthiest habit. The total score of this section is 24. Section 4, Students' dietary beliefs, includes 3 questions. Each question had four different responses, with the score ranging from 1 to 4. The total score of the section was 12. In the last section, nutrition knowledge that includes 11 questions, the response categories are four and the true response of each question received a score of 1 and 0 for the other response. The total score of this section was 11.

This Survey Reliability was acceptable and Cronbach's alpha ranged from a minimum of 0.55 to a maximum of 0.75. All the Pearson correlation coefficients were statistically significant with $p = 0.05$.

The Classification of the less and more healthier habits in which scores were granted to responses in this dietary questionnaire was based on the Mediterranean dietary regimen explained in "Krause's food, nutrition, and diet therapy textbook" authored by Kathleen, Mahan, and Stump (2004).

Since Lebanon is a Mediterranean Middle East country, Lebanese people are used to this type of dietary regimen so the nutritional habits evaluation will be based on this diet pattern.

5.3.3. Body Composition

Body mass and composition were determined using the Bioelectrical Impedance Analysis method and the InBody 270 (Biospace Co. Ltd, Seoul, Korea). The National Institutes of Health classified weight status into four categories: underweight (BMI < 18.5), normal weight (BMI between 18.5 – 24.9), overweight (BMI between 25–29.9), and obese (BMI > 30). (National Heart, Lung, and Blood Institute, 1998; Nuttal, 2015). The following percentage body fat ranges were considered normal: 10–20% for males and 18–28% for females (InBody, 2018).

Bioelectrical Impedance Analysis (BIA) works by passing a small electrical current through a person and measuring the resistance (impedance) of that current as it travels through the body's water. Body composition is calculated after measuring impedance (Hu, 2008; Kukic & Dopsaj, 2016, 2017).

5.4. VARIABLES

The Factors indicating the conditions of University students' lifestyle were Physical Activity, Eating Habits, and Body Composition. Regarding physical activity

sector, it comprised four levels of activities based on intensity and energy expenditure: Vigorous Activity, Moderate Activity, Walking, and Sitting. For Eating Habits Sector, five lists of variables were assessed: Frequency of Food Consumption, Food Habits, Physical Activity and Lifestyle, Dietary Beliefs, and Nutrition Knowledge. Finally, the Body Composition Section included the basic and derived Health and fitness indicators: Body Weight, Body Height, body Fat Mass, Skeletal Muscle Mass, Total body water, with Indexes and Percentages of these variables and their derived variables.

5.4.1. Physical Activity Variables

5.4.1.1. Vigorous Activity (VPA)

5.4.1.2. Moderate Activity (MPA)

5.4.1.3. Light Activity (LMP)

5.4.1.4. Sitting

5.4.2. Eating Habits Variables

5.4.2.1. Frequency of Food Consumption

5.4.2.2. Food Habits

5.4.2.3. Physical Activity and Lifestyle

5.4.2.4. Dietary Beliefs

5.4.2.5. Nutrition Knowledge

5.4.3. Body **Composition Variables**

5.4.3.1. Body Weight (Kg)

5.4.3.2. Body Height (cm)

5.4.3.3. Body Mass Index (BMI) (kg/m^2)

5.4.3.4. Body Fat Mass (BFM) (Kg)

5.4.3.5. Body Fat Mass Index (kg/m^2)

5.4.3.6. Percent of Body Fat (%)

5.4.3.7. Skeletal Muscle Mass (SMM) (Kg)

5.4.3.8. Skeletal Muscle Mass Index (kg/m²)

5.4.3.9. Percent of Skeletal Muscle Mass (%)

5.4.3.10. Total Body Water (TBW) (%)

5.4.3.11. Index of Hypokinesia (%/(kg/m²))

5.4.3.12. Muscle Fat Index (MFI)

5.5. STATISTICAL PROCEDURES

The IBM's Statistical Package for the Social Sciences (SPSS, version 25) has been utilized to conduct all the statistical analyses. The significant level have been set at $p < 0.05$.

Below are the Statistical procedures that have been used in this research:

A. Descriptive statistics: presenting the measures of central tendency and variability:
   - Mean
   - Standard Deviation (SD)
   - Minimum (min)
   - Maximum (max)
   - The coefficient of variation (cV%)
   - Kolmogorov-Smirnov test for distribution homogeneity (KST)

B. The Below Statistical methods have been used to determine the relations, significant differences, and predictions among the variables:
   - Pearson correlation
   - Chi square analysis
   - Independent samples t-test
   - Mann Whitney U Test.
   - Analysis of Variance (ANOVA)
   - Multivariate Analysis of Variance (MANOVA)
   - Multiple Regression Analysis (MRA)

6. RESULTS

6.1. DESCRIPTIVE SRATISTICS

6.1.1. Demographics and Participants' Characteristics

A total of 384 students (170 males and 214 females), with a mean age of 22.1± 4.1 years, studying at the two branches of the faculty of Education at the Lebanese University, fully completed the online survey and did the anthropometric measurements. Half of the participants were living at Mount Lebanon district while others were distributed among the North, South, Bekaa, and Beirut districts. Approximately half of the students were specialized in Physical Education and Sport major and most of them were in their second or third year of undergraduate study. The majority of the students' parents' level of education reported secondary and university academic levels. More than 90% of participants were single, and around half of them were employed. Significant differences between the sport sample (n=200) and the non-sport sample students (n=184) were only maintained in the following variables: Mother's level of education, father's level of education, and professional status. Regarding the parents' education, the PE and Sport sample showed higher level of parents' education in the secondary and university stages, while the non-sport students' sample showed that parents' education were approximately distributed on the four stages of education: elementary, intermediate, secondary, and university. In reference to the professional status, the sport sample reflected higher level of employment than the non-sport sample with percentages of 51% employed and 49% unemployed for males, and 55% employed and 45% unemployed for the females. All characteristics of the participating students are presented in Table 1.

6.1.2. Anthropometric Measurements and Physical Activity

As expected, male students were taller and heavier than females on average in both sport and non-sport specialization categories. It can be noted that most primary (5) and derived (7) parameters' values are higher in male students, which contributes to higher total BM in males. Exceptions are found in a higher body fat content in females (Females - 22.73% vs Males - 17.06%), body fat mass index (Females - 5.12 vs males - 4.58), Index of Hypokinesia (IH), (Females - 1.02 vs males - 0.65). Even though the mean body fat percentage was higher in females than in males, but values were within the healthy body fat percentage range: 10–20% for males and 18–28% for females (InBody, 2018).The mean estimated BMI ranges for all sample groups fall in the normal weight range as defined by (National Heart, Lung, and Blood Institute, 1998; Nuttal, 2015) except for the non-sport male sample which showed an overweight value of 27 kg* m^2.

According to university specialization, BMI values showed that the majority of examined students in the sport sample (82% male and 78% female) had normal weight (BMI in range of 18.50 and 24.99 kg*m^2), while normal weight of BMI among the non-sport sample was shown in (25% male and 64% female). Among all four-sample groups, the BMI percentages were categorized as follows:

Sample one or Sport males (n=100) scored the following BMI percentages: (underweight level = 0%, Normal Weight level = 82%, overweight level = 18%, and obese = 0%).

Sample two or sport females (n=100) scored the following BMI percentages: (underweight level = 17%, Normal Weight level = 78%, overweight level = 5%, and obese = 0%).

Sample three or non-sport males (n=70) scored the following BMI percentages: (underweight level = 3%, Normal Weight level = 25%, overweight level = 36%, and obese = 36%).

Sample four or non-sport females (n=114) scored the following BMI percentages: (underweight level = 13%, Normal Weight level = 64%, overweight level = 23%, and obese = 0%).

Males in both sport and non-sport samples were of equal height (BH= 177cm) while non-sport sample males were heavier (Table 2 and Table 4). Sport males had lesser values of fat mass, index of hypokinesia, body fat mass index, but higher values of skeletal muscle mass percentage, total body water, muscle fat index, indicating better body composition status. Regarding Females (Table 3 and Table 5), body height values were similar with (164 cm for sport sample and 163 for non-sport sample). Non-sport females were heavier as expected. Other primary and derived parameters showed similar and close values between both specializations' students.

In physical activity, and based on intensity and type of activity, as it may have been expected, male students were more physically active than females. University specialization classification showed that the sport sample students were more active than their non-sport colleagues including the three types of PA activities (VPA, MPA, and LPA including walking), and this result was displayed in fulfilling the (WHO, 2006) recommendations, unlike the non-sport sample students who did not fulfill these recommendations. In total, the sport specialty males achieved a combination of 205 minutes per week including 113.7 min/week of VPA, and 91.4 min/week of MPA, and with this combination, this sample group has achieved the level of physical activity recommended by (WHO, 2006). However, the non-sport males achieved a combination of 85.2 minutes per week including 41.3 min/week of VPA, and 43.9 min/week of MPA, and with these averages, non-sport males did not reach the (WHO, 2006) recommended level of weekly physical activity. Regarding the female gender, the sport specialty females achieved a physical activity combination of 184.4 minutes per week including 88.8 min/week of VPA, and 95.6 min/week of MPA, and with this combination, the female sport sample has achieved the level of physical activity recommended by (WHO, 2006). However, the non-sport females which achieved a combination of 79.2 minutes per week including 29.9 min/week of VPA, and 49.3 min/week of MPA did not reach the WHO recommended level of weekly physical activity. Sitting during weekdays and weekends was higher in average for the non-sport students (6.85 Hours/Day) than the sport sample (5.65 H/D). However, the total sitting time for the Lebanese students was 6.25 H/D. The aforementioned results and all other results are shown in Tables 2, 3, 4, and 5 where descriptive statistics were presented.

Table 1: Sample characteristics

Variable	Sport Sample		Non- sport Sample		Total (N= 384)	p value
	Mean±SD Males	Mean±SD Females	Mean±SD Males	Mean±SD Females	Mean±SD	
Gender						
Males	100		70			
Females		100		114		
Age (Years)	21.5± 2.9	21.8 ± 4.1	23.6± 4.1	21.9± 4.7	22.1± 4.1	0.055
Place of Birth (%)						
Lebanon	99	100	95.7	97.4	98	0.147
Outside Lebanon	01	0	4.3	2.6	02	0.147
Place of Living (%)						
Mount Lebanon	50	54	32.9	69.3	51.6	0.775
North Lebanon	07	06	22.9	2.6	9.6	0.775
South Lebanon	25	17	11.4	07	15.1	0.775
Bekaa	02	07	5.7	2.6	4.3	0.775
Beirut	16	16	27.1	18.5	19.4	0.775
Major of Study (%)						
Physical Education and Sport	50	50	0	0	52	
Other Majors	0	0	38	62	48	
Academic Year (%)						
1st Academic Year	23	13	17.1	16.7	17.5	0.066
2nd Academic Year	51	59	47.1	43.8	50.2	0.066
3rd Academic Year	26	28	35.8	39.5	32.3	0.066
Mother's Level of Education (%)						
Elementary	0	03	10	8.8	5.5	0.000
Intermediate	06	13	20	16.7	13.9	0.000
Secondary	25	27	30	20.1	25.5	0.000
University	69	57	40	54.4	55.1	0.000
Father's Level of Education (%)						
Elementary	0	02	4.3	6.1	3.1	0.000
Intermediate	04	15	18.6	23.7	15.3	0.000
Secondary	15	27	35.7	24.6	25.6	0.000
University	81	56	41.4	45.6	56	0.000
Marital Status (%)						
Single	99	91	91.4	93	93.6	0.292
Married	01	09	8.6	07	6.4	0.292
Families with Children	01	09	05	06	5.25	0.674
Professional Status (%)						
Employed	51	55	50	27.2	45.8	0.001
Unemployed	49	45	50	72.8	54.2	0.001

Table 2: Descriptive Statistics for male PE and Sport students

Variable	Mean	SD	Min	Max	cV (%)	KST
Age	21.5	2.9	18.0	38.0	13.3	0.000
BH (cm)	177.0	7.0	159.0	199.0	3.8	0.064
BM (kg)	72.8	10.2	52.9	102.2	13.7	0.200
BMI	23.2	2.4	18.6	29.3	10.4	0.200
BFM (kg)	9.0	4.0	2.9	23.0	45.0	0.058
PBFM (%)	12.0	4.3	5.0	23.6	35.6	0.200
SMM (kg)	44.7	11.6	19.6	77.2	25.8	0.012
PSMM (%)	60.4	7.7	36.9	78.8	12.7	0.094
TBW (%)	62.8	5.0	38.9	73.6	7.9	0.142
IH (Index Unit)	0.5	0.2	0.2	0.9	30.8	0.200
MFI (Index Unit)	5.7	2.1	2.2	10.5	37.7	0.000
SMMI (kg/m^2)	14.2	3.0	7.7	22.4	21.4	0.006
BFMI (kg/m^2)	2.8	1.2	1.0	6.8	42.8	0.146
VPA Days/week	2.2	1.0	0.0	4.7	43.6	0.008
VPA min/Day	51.7	20.6	0.0	100.0	40.0	0.043
MPA Days/week	2.0	1.3	0.0	5.0	66.6	0.002
MPA min/Day	45.7	26.6	0.0	112.5	58.3	0.200
LPA/Walking Days/week	4.0	1.5	0.7	7.0	38.1	0.000
LPA/Walking min/Day	53.3	25.2	10.0	140.0	47.2	0.000
Sitting in Weekdays hours/Day	5.4	2.5	1.0	12	45.13	0.016
Sitting in Weekends hours/day	6.2	3.0	0.0	20	48.67	0.000

SD – Standard Deviation, Min – Minimum, Max – Maximum, cV (%) – Coefficient of Variation -

KST – Kolmogorov Smirnov Test.

Table 3: Descriptive Statistics for female PE and Sport students

Variable	Mean	SD	Min	Max	cV (%)	KST
Age	21.8	4.1	18	41	18.9	0.000
BH (m)	164	0.06	152	177	3.4	0.011
BM (kg)	56.4	7.0	42.3	73	12.5	0.033
BMI	20.9	2.3	15.9	27.7	10.9	0.200
BFM (kg)	12.3	4.7	5.4	24.5	38.7	0.000
PBFM (%)	22.2	5.8	11	35.4	27.6	0.001
SMM (kg)	23.8	4.5	14.6	34.2	18.9	0.023
PSMM (%)	42.0	3.4	34.5	49.0	8.1	0.027
TBW (%)	56.8	4.9	47.9	66.8	8.7	0.002
IH	1.0	0.2	0.6	1.5	20.3	0.200
MFI	2.1	0.6	1.2	3.8	27.3	0.126
SMMI (kg/m^2)	8.8	1.4	6.0	11.8	16.2	0.097
BFMI (kg/m^2)	4.5	1.7	1.9	9.8	37.2	0.000
VPA Days/week	2.0	1.2	0.0	4.7	57.3	0.090
VPA min/Day	44.4	26.3	0.0	120.0	59.2	0.065
MPA Days/week	1.9	1.0	0.3	3.80	51.3	0.000
MPA min/Day	50.3	25.8	11.3	112.5	51.4	0.000
LPA/Walking Days/week	3.2	1.6	0.0	6.0	48.8	0.010
LPA/Walking min/Day	42.1	26.1	0.0	115.0	61.9	0.066
Sitting in weekdays hours/day	4.6	2.0	1.0	9.0	43.5	0.000
Sitting in weekends hours/day	6.4	2.0	2.0	12.0	31.9	0.000

SD – Standard Deviation, Min – Minimum, Max – Maximum, cV (%) – Coefficient of Variation

KST – Kolmogorov Smirnov Test.

Table 4: Descriptive Statistics for male students of non-sport majors

Variable	Mean	SD	Min	Max	cV (%)	KST
Age	23.6	4.1	17	35	17.2	0.097
BH (m)	177	0.07	163	191	3.9	0.200
BM (kg)	87.4	16.4	52.2	142.9	19.3	0.200
BMI	27.8	4.9	16.9	39.6	17.8	0.823
BFM (kg)	22.2	10.0	2.0	51.6	45.1	0.339
PBFM (%)	24.3	7.7	3.8	39.8	31.6	0.364
SMM (kg)	53.8	17.0	24.5	119	31.5	0.200
PSMM (%)	60.3	7.8	46.0	83.2	13	0.032
TBW (%)	50.7	7.7	36.1	65.7	15.2	0.134
IH	0.9	0.2	0.2	1.7	24.6	0.007
MFI	2.9	1.6	1.4	12.4	54.5	0.000
SMMI (kg/m^2)	17.0	4.8	7.9	32.9	23.3	0.200
BFMI (kg/m^2)	7.1	3.1	0.6	14.7	44.5	0.297
VPA Days/week	1.1	1.0	0.0	6.0	89.6	0.003
VPA min/Day	37.5	33.3	0.0	160.0	88.8	0.005
MPA Days/week	1.2	0.8	0.0	3.5	67.8	0.005
MPA min/Day	36.6	22.0	0.0	90.0	60.1	0.034
LPA/Walking Days/week	2.5	1.5	0.0	6.3	60.4	0.027
LPA/Walking min/Day	41.9	20.5	0.0	90.0	48.9	0.032
Sitting in weekdays hours/day	5.6	2.2	2.0	12.0	93.1	0.000
Sitting in weekends hours/day	8.0	2.6	3.0	18.0	32.1	0.000

SD – Standard Deviation, Min – Minimum, Max – Maximum, cV (%) – Coefficient of Variation

KST – Kolmogorov Smirnov Test.

Table 5: Descriptive Statistics for female students of non-sport majors

Variable	Mean	SD	Min	Max	cV (%)	KST
Age	21.9	4.7	18.0	48.0	21.4	0.000
BH (m)	163.0	0.05	150.0	175.0	3.2	0.004
BM (kg)	59.7	10.1	42.3	81.0	17.0	0.200
BMI	22.4	3.4	15.5	29.7	15.2	0.069
BFM (kg)	15.5	6.1	3.8	31.3	43.7	0.064
PBFM (%)	24.1	7.5	8.9	38.7	31.2	0.003
SMM (kg)	25.1	6.1	15.4	39.8	24.4	0.046
PSMM (%)	41.5	3.6	36.3	49.2	8.6	0.200
TBW (%)	53.4	4.7	44.0	62.6	8.7	0.045
IH	1.10	0.2	0.5	1.5	22.3	0.000
MFI	1.9	0.7	1.1	4.3	38.2	0.000
SMMI (kg/m^2)	9.4	2.1	5.7	13.7	22.0	0.972
BFMI (kg/m^2)	5.6	2.3	1.4	11.0	41.7	0.071
VPA Days/week	1.1	1.4	0.0	6.30	126.4	0.000
VPA min/Day	27.2	26.2	0.0	100.0	96.2	0.000
MPA Days/week	1.3	1.0	0.0	4.30	79.2	0.003
MPA min/Day	37.9	27.8	0.0	105.0	73.5	0.004
LPA/Walking Days/week	2.4	1.8	0.0	7.00	74.3	0.000
LPA/Walking min/Day	30.6	23.2	0.0	120.0	75.7	0.016
Sitting in weekdays hours/day	7.0	4.3	2.0	20.0	60.9	0.000
Sitting in weekends hours/day	6.8	3.6	1.0	20.0	53.1	0.000

SD – Standard Deviation, Min – Minimum, Max – Maximum, cV (%) – Coefficient of Variation

KST – Kolmogorov Smirnov Test.

6.2. THE LIFESTYLE FACTORS VARIABLES' STATISTICS

6.2.1. Mann Whitney U Test for non-parametric parameters of Physical Activity

The IPAQ physical activity survey results showed similar scores for male students and female students in both sport and non-sport specializations in the most IPAQ variables including the four physical activity domains (Work related PA, transportation PA, home or domestic related PA, and leisure time PA).

In the sport sample (n=200), both genders showed similar scores among the four PA domains except few significant differences (9 out of 26 variables). These significant differences were shown in the following results: (Days of VPA at work, females scored higher average, p=.037), (Days and time of traveling in motor vehicle, males scored higher average, p= .000 and .009 respectively), (Time of walking as transportation, males scored higher average, p= .000), (Days and time of vigorous PA at home, males score higher averages, p= .000 and .000 respectively), (Days and time of walking in leisure time, males scored higher averages, p= .000 and .022 respectively), and finally (days of sitting during weekdays, males scored higher average, p= .008, Table 6).

In the non-sport sample (n=184), twelve out of twenty-six variables carried gender-based significant differences among the four tested physical activity domains. These significant differences took place in the following variables: (Days and time of work related walking activity, males scored higher averages, p=.032 and .012 respectively), (Days and time of cycling activity, females scored higher average in days of cycling but lower average in cycling time/day, p= .006 for both variables), (Days of walking as transportation, females scored higher average, p= .001), (Days and time of home related vigorous PA, males score higher averages, p= .003 and .007 respectively), (Days and time of home related moderate PA, females scored higher averages, p= .001 and .006 respectively), (time of leisure time walking, males scored higher average, p= .022), (Time of leisure time moderate PA, males scored higher average, p= .029), and finally (Time spent sitting during weekends, males scored higher average, p= .004, Table 7).

Gender based Mann Whitney U Test across the sport sample displayed significant differences between males and females only in walking activities and traveling in a motor vehicle where males were more active than females.

Regarding vigorous PA, Moderate PA, a slightly supremacy was reported by males, where in cycling activities, both genders reported almost same time spent in cycling. As for sitting activities, males and females have almost reported the same sitting hours per weekend and weekdays. These results are shown in Table 8.

Table 6. Significant differences of IPAQ Physical Activity Variables for Sport Sample based on gender.

	Variable	Sport Sample (200)				Z score	p value
		Males (100)		Females (100)			
		Days/W Mean	Min/Day Mean	Days/W Mean	Time/Day Mean		
1	A2. During the last 7 days, on how many days did you do vigorous physical activities like heavy lifting, digging, heavy construction, or climbing up stairs as part of your work? (Days/Week)	2.3		2.9		-2.082	**0.037**
2	A3. How much time did you usually spend on one of those days doing vigorous physical activities as part of your work? (Minutes /Day)		62.3		59	-0.665	0.506
3	A4. During the last 7 days, on how many days did you do moderate physical activities like carrying light loads as part of your work? Please do not include walking. (Days/Week)	2.8		2.3		-1.601	0.109
4	A5. How much time did you usually spend on one of those days doing moderate physical activities as part of your work? (Minutes/Day)		63		70.2	-1.471	0.141
5	A6. During the last 7 days, on how many days did you walk for at least 10 minutes at a time as part of your work? Please do not count any walking you did to travel to or from work. (Days/Week)	3.3		3.2		-0.584	0.559
6	A7. How much time did you usually spend on one of those days walking as part of your work (Minutes /Day)		56.6		59.5	-0.606	0.545
7	A8. During the last 7 days, on how many days did you travel in a motor vehicle like a train, bus, car, or tram? (Days / Week)	4.9		3.7		-3.564	**0.000**
8	A9. How much time did you usually spend on one of those days traveling in a train, bus, car, tram, or other kind of motor vehicle? (Minutes / Day)		71.9		52.8	-2.61	**0.009**
9	A10. During the last 7 days, on how many days did you bicycle for at least 10 minutes at a time to go from place to place? (Days/Week)	0.6		0.6		-0.251	0.802
10	A11. How much time did you usually spend on one of those days to bicycle from place to place? (Minutes / Day)		15.8		21.6	-0.104	0.917
11	A12. During the last 7 days, on how many days did you walk for at least 10 minutes at a time to go from place to place? (Days/Week)	4.5		3.9		-1.658	0.097
12	A13. How much time did you usually spend on one of those days walking from place to place? (Minutes/ Day)		52.5		28.1	-6.735	**0.000**
13	A14. During the last 7 days, on how many days did you do vigorous physical activities like heavy lifting, chopping wood, shoveling snow, or digging in the garden or yard (Days/Week)	2.0		0.8		-5.024	**0.000**

14	A15. How much time did you usually spend on one of those days doing vigorous physical activities in the garden or yard? (Minutes /Day)		38.5		16.5	-6.039	**0.000**
15	A16. During the last 7 days, on how many days did you do moderate activities like carrying light loads, sweeping, washing windows, and raking in the garden or yard? (Days/Week)	1.7	52.36	1.7		-0.652	0.514
16	A17. How much time did you usually spend on one of those days doing moderate physical activities in the garden or yard? (Minutes /Day)		30.8		41.7	-1.317	0.188
17	A18. During the last 7 days, on how many days did you do moderate activities like carrying light loads, washing windows, scrubbing floors and sweeping inside your home? (Days/Week)	2.2	106.48	2.4		-1.011	0.312
18	A19. How much time did you usually spend on one of those days doing moderate physical activities inside your home (Minutes or Hours/Day)		48.4		48.3	-0.656	0.512
19	A20. Not counting any walking you have already mentioned, during the last 7 days, on how many days did you walk for at least 10 minutes at a time in your leisure time (Days/Week)	4.2		2.5		-4.781	**0.000**
20	A21. How much time did you usually spend on one of those days walking in your leisure time? (Minutes or Hours/Day)		50.9		38.8	-2.288	**0.022**
21	A22. During the last 7 days, on how many days did you do vigorous physical activities like aerobics, running, fast bicycling, or fast swimming in your leisure time (Days/Week)	2.2		2.3		-0.32	0.749
22	A23. How much time did you usually spend on one of those days doing vigorous physical activities in your leisure time (Minutes /Day)		53.4		57.8	-0.825	0.41
23	A24. During the last 7 days, on how many days did you do moderate physical activities like bicycling at a regular pace, swimming at a regular pace, and doubles tennis in your leisure time? (Days/Week)	1.4		1.1		-1.013	0.311
24	A25. How much time did you usually spend on one of those days doing moderate physical activities in your leisure time? (Minutes /Day)		40.5		41	-0.911	0.362
25	A26. During the last 7 days, how much time did you usually spend sitting on a weekday? (Hours /Day)		5.4		4.6	-2.646	**0.008**
26	A27. During the last 7 days, how much time did you usually spend sitting on a weekend day? (Hours/Day)		6.2		6.4	-0.849	0.396

* - significant variation at $p<0.05$

Table 7. Significant differences of IPAQ Physical Activity Variables for non-Sport Sample based on gender.

	Variable	Non-Sport Sample (184)				Z score	p value
		Males (70)		Females (114)			
		Days/W Mean	Min/Day Mean	Days/W Mean	Min/Day Mean		
1	A2. During the last 7 days, on how many days did you do vigorous physical activities like heavy lifting, digging, heavy construction, or climbing up stairs as part of your work? (Days/Week)	1.3		1.6		-0.139	0.889
2	A3. How much time did you usually spend on one of those days doing vigorous physical activities as part of your work? (Minutes /Day)		46.5		38.8	-1.133	0.257
3	A4. During the last 7 days, on how many days did you do moderate physical activities like carrying light loads as part of your work? Please do not include walking. (Days/Week)	1.3		1.1		-1.555	0.120
4	A5. How much time did you usually spend on one of those days doing moderate physical activities as part of your work? (Minutes/Day)		40.8		42.1	-0.519	0.604
5	A6. During the last 7 days, on how many days did you walk for at least 10 minutes at a time as part of your work? Please do not count any walking you did to travel to or from work. (Days/Week)	2.7		2.2		-2.145	**0.032**
6	A7. How much time did you usually spend on one of those days walking as part of your work (Minutes /Day)		48.9		36.5	-2.514	**0.012**
7	A8. During the last 7 days, on how many days did you travel in a motor vehicle like a train, bus, car, or tram? (Days / Week)	3.7		3.9		-0.376	0.707
8	A9. How much time did you usually spend on one of those days traveling in a train, bus, car, tram, or other kind of motor vehicle? (Minutes / Day)		67.9		65.9	-0.286	0.775
9	A10. During the last 7 days, on how many days did you bicycle for at least 10 minutes at a time to go from place to place? (Days/Week)	0.4		0.1		-2.761	**0.006**
10	A11. How much time did you usually spend on one of those days to bicycle from place to place? (Minutes / Day)		21.9		7.5	-2.722	**0.006**
11	A12. During the last 7 days, on how many days did you walk for at least 10 minutes at a time to go from place to place? (Days/Week)	1.9		3.0		-3.232	**0.001**
12	A13. How much time did you usually spend on one of those days walking from place to place? (Minutes/ Day)		33		26.3	-0.928	0.354
13	A14. During the last 7 days, on how many days did you do vigorous physical activities like heavy lifting, chopping wood, shoveling snow, or digging in the garden or yard (Days/Week)	1.2		0.7		-2.92	**0.003**

14	A15. How much time did you usually spend on one of those days doing vigorous physical activities in the garden or yard? (Minutes /Day)		35.9		20.8	-2.72	**0.007**
15	A16. During the last 7 days, on how many days did you do moderate activities like carrying light loads, sweeping, washing windows, and raking in the garden or yard? (Days/Week)	1.4		1.2		-0.576	0.565
16	A17. How much time did you usually spend on one of those days doing moderate physical activities in the garden or yard? (Minutes /Day)		36.9		35.4	-0.312	0.755
17	A18. During the last 7 days, on how many days did you do moderate activities like carrying light loads, washing windows, scrubbing floors and sweeping inside your home? (Days/Week)	1.2		2.2		-3.326	**0.001**
18	A19. How much time did you usually spend on one of those days doing moderate physical activities inside your home (Minutes or Hours/Day)		38.4		56.8	-2.736	**0.006**
19	A20. Not counting any walking you have already mentioned, during the last 7 days, on how many days did you walk for at least 10 minutes at a time in your leisure time (Days/Week)	2.9		2.0		-1.913	0.056
20	A21. How much time did you usually spend on one of those days walking in your leisure time? (Minutes or Hours/Day)		43.8		29	-2.299	**0.022**
21	A22. During the last 7 days, on how many days did you do vigorous physical activities like aerobics, running, fast bicycling, or fast swimming in your leisure time (Days/Week)	0.9		1.0		-0.1	0.92
22	A23. How much time did you usually spend on one of those days doing vigorous physical activities in your leisure time (Minutes /Day)		30.2		22.1	-0.698	0.485
23	A24. During the last 7 days, on how many days did you do moderate physical activities like bicycling at a regular pace, swimming at a regular pace, and doubles tennis in your leisure time? (Days/Week)	0.8		0.7		-1.622	0.105
24	A25. How much time did you usually spend on one of those days doing moderate physical activities in your leisure time? (Minutes /Day)		30.2		17.1	-2.179	**0.029**
25	A26. During the last 7 days, how much time did you usually spend sitting on a weekday? (Hours /Day)		5.6		7.0	-1.6	0.11
26	A27. During the last 7 days, how much time did you usually spend sitting on a weekend day? (Hours/Day)		8.0		6.8	-2.889	**0.004**

* - significant variation at $p<0.05$

Table 8. Gender based significant differences of IPAQ Physical Activity Variables for Sport Sample according to intensity level.

	Total Sample Characteristics	Sport Sample					
		Males		Females		Z score	p value
		Days/W Mean	Min/Day Mean	Days/W Mean	Min/Day Mean		
1	**Vigorous Physical Activity**	2.17		2.00		-0.996	0.319
			51.4		44.4	-1.81	0.07
2	**Moderate Physical Activity**	2.03		1.9		-0.189	0.85
			45.7		50.3	-0.569	0.569
3	**Walking Activities**	4.0		3.20		-3.189	**0.001**
			53.3		42.1	-3.069	**0.002**
4	**Travelling in a motor vehicle**	4.9		3.7		-3.564	**0.000**
			71.9		52.8	-2.61	**0.009**
5	**Cycling Activities**	0.6		0.6		-0.251	0.802
			15.8		21.6	-0.104	0.917
6	**Sitting Activities (Hours/Day)**		5.8		5.5	-1.162	0.245
7	**Sitting Activities (Min/week)**		348		330	-1.162	0.254

In the non-sport sample, males were slightly more active in days of weekly vigorous activity and days of walking. Significant differences between males and females were displayed in time of daily vigorous activity, time of daily walking, and time of cycling activity. Walking activities and traveling in a motor vehicle where males were more active than females, (Table 9).

As for moderate PA, travelling in a motor vehicle, and sitting activities, males and females have almost reported the similar results where no significant difference was determined between genders, (Table 9).

Based on students' specialization, the Mann Whitney U Test displayed significant differences between males in most physical activity variables except in the cycling activity and time of traveling in a motor vehicle, (Table 10). Sport major male students were more active than their non-sport colleagues in all intensity types of physical education, VPA, MPA, and LPA or walking, while the non-sport students scored higher averages in sitting activities

Regarding the female gender, significant differences existed also in most PA variables except in the days of traveling in the motor vehicle, (Table 11). Sport major female students showed also higher averages in all intensity types of physical education, VPA, MPA, and LPA or walking, while the non-sport students scored higher averages in traveling in motor vehicle and sitting activities.

Table 9. Gender based significant differences of IPAQ Physical Activity Variables for non- Sport Sample according to intensity level.

Total Sample Characteristics		Non-Sport Sample (184)					
		Males		Females		Z score	p value
		Days/W Mean	Min/Day Mean	Days/W Mean	Min/Day Mean		
1	Vigorous Physical Activity	1.13		1.10		-1.67	0.095
			37.53		27.23	-2.645	**0.008**
2	Moderate Physical Activity	1.2		1.3		-0.03	0.976
			29.0		33.6	-0.024	0.981
3	Walking Activities	2.5		2.4		-0.753	0.451
			41.9		30.6	-3.961	**0.000**
4	Travelling in a motor vehicle	3.7		3.9		-0.376	0.707
			67.9		65.9	-0.286	0.775
5	Cycling Activities	0.4		0.1		-2.761	**0.006**
			21.9		7.5	-2.722	**0.006**
6	Sitting Activities (Hours/Day)		6.8		6.9	-0.906	0.365
7	Sitting Activities (Min/week)		408		414	0.906	0.365

Table 10. Significant differences of IPAQ Physical Activity Variables for male students based on university Specialization.

	Total Sample Characteristics	Man Whitney U Test					
		Non Sport Males		Sport Males		Z score	p value
		Days/ W Mean	Min/Day Mean	Days/ W Mean	Min/Day Mean		
1	Vigorous Physical Activity	1.13		2.17		-6.704	**0.000**
			37.53		51.4	-3.75	**0.000**
2	Moderate Physical Activity	1.20		2.0		-4.139	**0.000**
			29.0		45.7	-2.365	**0.018**
3	Walking Activities	2.5		4.00		-5.745	**0.000**
			41.9		53.3	-2.9	**0.004**
4	Travelling in a motor vehicle	3.7		4.9		-3.311	**0.001**
			67.9		71.9	-1.047	0.295
5	Cycling Activities	0.4		0.6		-0.211	0.833
			21.9		15.8	-0.432	0.666
6	Sitting Activities (Hours/Day)		6.8		5.8	-2.663	**0.008**
7	Sitting Activities (Min/Week)		408		348	-2.663	**0.008**

Table 11. Significant differences of IPAQ Physical Activity Variables for female students based on university Specialization.

	Total Sample Characteristics	Man Whitney U Test					
		Non-Sport Females		Sport Females		Z score	p value
		Days/W Mean	Min/Day Mean	Days/W Mean	Min/Day Mean		
1	Vigorous Physical Activity	1.10		2.00		-6.002	**0.000**
			27.23		44.40	-4.666	**0.000**
2	Moderate Physical Activity	1.3		1.9		-3.969	**0.000**
			33.6		50.3	-3.151	**0.000**
3	Walking Activities	2.4		3.2		-3.673	**0.000**
			30.6		42.1	-3.338	**0.001**
4	Travelling in a motor vehicle	3.9		3.7		-0.361	0.718
			65.9		52.8	-3.204	**0.001**
5	Cycling Activities	0.1		0.6		-2.788	**0.005**
			7.5		21.6	-2.603	**0.009**
6	Sitting Activities (Hours/Day)		6.9		5.5	-2.991	**0.003**
7	Sitting Activities (Min/Week)		414		330	-2.991	**0.003**

The Mann Whitney U test that was used to determine the levels of continuous score of IPAQ scoring protocol expressed in Metabolic equivalent (MET) indicated several significant difference between genders through three main IPAQ domains (transportation, domestic and gardening, and leisure time) activities (Tables 12-13). Regarding the sport student sample, a significant difference was shown in the transportation domain with males achieving a mean of 779.9 Met/min/week and females achieving 361.7 MET/min/week with a p value of 0.000. Another significant difference between genders of the sport sample was shown through the home-related activities and specifically in the vigorous activity around home where males completed a mean of 616 MET/min/week and females completed a mean of 105.6 MET/min/week with a p value of .000. The domain of leisure time related-activities and specifically the walking activity has also encompassed a gender significant difference in the sport sample obtaining a mean of 705 MET/min/week for males and 320 MET/min/week for females with a p value of .000. The last gender based significant difference in the sport student sample was established in the sitting during weekdays since males have scored a mean of 324 MET/min/week while females scored a mean of 276 MET/min/week having a p value of .008.

As for the non-sport student sample, the vigorous activity around home, in the domain of home-related activities included a gender based significant difference where males achieved a mean of 344 MET/min/week while females achieved a mean of 116 MET/min/week presenting a p value of .004. In the same physical activity domain, the moderate at home activity indicated a significant difference between genders where males score a mean of 184 MET/min/week while females scored a mean of 500 MET/min/week presenting a p value of .001. The domain of leisure time-related activities indicated another gender based significant difference in the walking activities since males achieved a mean of 419 MET/min/week and females achieved a mean of 191.4 MET/min/week with a p value of .007. Finally, sitting during the weekends has also indicated a gender based significant difference in the non-sport sample where males had a sitting mean of 480 MET/min/week while females had a mean of 408 MET/min/week with a p value of .004. Tables 12-13 clearly show these results.

The level of weekly total physical activity for the sport sample based on domains of physical activity expressed in three energy dimensions: vigorous, moderate, walking was 6447 MET/min/week in males, and 5434 MET/min/week in females. As for the non-sport sample, these results presented 2846 Met/min/week in males and 2413 Met/min/week in females. The total MET/min/week classification of the Lebanese university students was 4285 MET/min/week, (Table 14).

Table 12: Continuous scores of Physical Activity presented in MET-Min/Week for sport sample

Domain	Sport Sample					
	Males		**Females**		**Test**	
	Mean	MET-Min/Week	Mean	MET-Min/Week	Z	P
Work related Physical Activities						
Vigorous	145.6	1164.8	171.1	1368.8	-1.451	0.147
Moderate	176.4	705.6	161.5	646	-0.367	0.714
Walking	186.8	616.44	190.4	628.32	-0.498	0.619
Total	508.8	2486.84	523	2643.12		
Transportation Related Activity						
Motor Vehicle	352.3	352.3	195.4	195.4	-3.514	0.000
Cycling	9.48	56.88	12.96	77.76	-0.105	0.916
Walking	236.3	779.79	109.6	361.68	-4.891	0.000
Total	598.08	1188.97	317.96	634.84		
Home - Related Activities						
Vigorous around Home	77	616	13.2	105.6	-5.322	0.000
Moderate around home	52.4	209.6	70.9	283.6	-0.988	0.323
Moderate at Home	106.5	426	115.9	463.6	-1.029	0.304
Total	235.9	1251.6	200	852.8		
Leisure Time related Activities						
Vigorous	117.5	940	132.9	1063.2	-0.937	0.349
Moderate	56.7	226.8	45.1	180.4	-0.878	0.380
Walking	213.7	705.21	97	320.1	-4.394	0.000
Total	387.9	1872.01	275	1563.7		
Sitting (min/week)						
During the Weekdays	324	324	276	276	-2.646	0.008
During the Weekends	372	372	384	384	-0.849	0.396
Total	696	696	660	660		

* - significant variation at $p<0.05$; Z-value of the Mann-Whitney U test

Table 13: Continuous scores of Physical Activity presented in MET-Min/Week for non-sport sample

Non-Sport Sample						
Domain	Males		Females		Test	
	Mean	MET-Min/Week	Mean	MET-Min/Week	Z	P
Work related Physical Activities						
Vigorous	60.45	483.6	62	496	-0.018	0.986
Moderate	50	200	46.3	185.2	-1.008	0.313
Walking	132	435.6	80.3	264.99	-1.945	0.052
Total	242.45	1119.2	188.6	946.19		
Transportation Related Activity						
Motor Vehicle	251.2	251.2	257	257	-0.081	0.935
Cycling	8.67	52.02	0.75	4.5	-2.761	0.006
Walking	62.7	206.91	78.9	260.37	-1.077	0.282
Total	322.57	510.13	336.65	521.87		
Home - Related Activities						
Vigorous around Home	43	344	14.5	116	-2.916	0.004
Moderate around home	51.7	206.8	42.5	170	-0.411	0.681
Moderate at Home	46	184	125	500	-3.381	0.001
Total	140.7	734.8	182	786		
Leisure Time related Activities						
Vigorous	27.1	216.8	22.1	176.8	-0.483	0.629
Moderate	24.2	96.8	12	48	-1.805	0.071
Walking	127	419.1	58	191.4	-2.685	0.007
Total	178.3	732.7	92.1	416.2		
Sitting (min/week)						
During the Weekdays	336	336	420	420	-1.766	0.077
During the Weekends	480	480	408	408	-2.889	0.004
Total	816	816	828	828		

* - significant variation at $p<0.05$; Z-value of the Mann-Whitney U test

Table 14: Total Met-min/week levels based on students' gender and university specialization.

Sport Sample			Non-Sport Sample		
Activity Type	Males	Females	Activity Type	Males	Females
Vigorous Activities	2720.8	2537.6	Vigorous Activities	1044.4	788.8
Moderate	1568.0	1573.6	Moderate	687.6	903.2
Walking	2101.4	1310.1	Walking	1061.6	716.8
Cycling	56.9	13.0	Cycling	52.0	4.5
Total MET-min/week	**6447.1**	**5434.3**	Total MET-min/week	**2845.6**	**2413.3**
Total Sample	**5941**		Total Sample	**2629**	
Total Lebanese Sample	**4285 Met/min/week**				

Levels of physical activity and inactivity among the sport students sample showed that the percentages of sport students that were engaged in vigorous, moderate, and walking activities were 93.6, 96.4, and 96.4% respectively. However, the non-sport students' percentages in the same three energy dimensions were 71.2, 88, and 91.8% respectively.

Physical activity was found to be highly prevalent in the three main energy dimensions: vigorous, moderate, walking. In the vigorous dimension, the sport sample students were engaged with a percentage of 93.6% (n= 188) while the non-sport student sample had a percentage of 71.2% (n=131). As for the Moderate dimension, the sport sample students showed a percentage of 96.4% (n= 193) engagement while the non-sport student sample showed a percentage of 88% (n=162). Finally, the walking dimension or light physical activity expressed students' engagements percentages of 96.4% (n=193), and 91.8% (n=169) for the sport and non-sport samples respectively. Table 15 shows the result of these percentages.

Table 15: Prevalence of Level of physical activity and inactivity in different types of activity by university specialization

	Activity Level			**Inactivity Level**		
Activity Intensity	Total # (n=384)	Sport Sample (n=200)	Non-sport sample (n=184)	Total # (n=384)	Sport Sample (n=200)	Non-sport sample (n=184)
Vigorous	83.1% (319)	93.6% (188)	71.2% (131)	16.9% (65)	6.4% (12)	28.8%(53)
Moderate	92.5% (355)	96.4% (193)	88% (162)	7.5% (29)	3.6% (7)	12% (22)
Walking	94.3% (362)	96.4% (193)	91.8%(169)	5.7% (22)	3.6% (7)	8.2% (15)

The categorical physical activity levels for the entire Lebanese students sample (n=384) (Table 16) displayed a high physical activity level of 23.5% (n= 90), while the

moderate physical activity level was 30.5% (n= 117), and finally the low level were 46% (n= 177).

Based on the study specification, the sport major students' sample (n=200) showed higher levels of physical activity since their PA levels displayed the following results: a high physical activity level of 30.5%, (n= 61), a moderate physical activity level of 42.5%, (n= 85), and a low level of 27% (n= 54). However, the non-sport major students sample (n=184) showed that most of them (66.9%, n= 123) have low level of PA, while (15.7%, n= 29) were highly active, and (17.4%, n= 32) were moderately active.

Regarding gender based PA classification, the sport males (n=100) showed higher values of PA in comparison to non-sport males (n=70) according to the following results: Sport males, (high PA level 32% n=32, Moderate PA level 45% n=45, Low PA level 23% n=23), while non-sport males displayed the following results: (high PA level 8.6% n=6, Moderate PA level 17% n=12, Low PA level 74.3% n=52).

Regarding females, the sport major female student sample (n=100) displayed the following results: (high PA level 29% n=29, Moderate PA level 40% n=40, Low PA level 31% n=31), while the non-sport female sample (n=114) displayed the following results: (high PA level 20.3% n=23, Moderate PA level 17.5% n=20, Low PA level 62.3% n=71).

6.2.2. Mann Whitney U Test for non-parametric parameters of Dietary Habits

Results showed that students of both majors and genders have 'satisfactory' Dietary habits. All nutrition survey sub-sections' mean scores among all four students' samples were above average. The Mann Whitney U Test for non-parametric measurements showed that in the university major based classification, three significant differences were determined between both sport and non-sport major students in Dietary habits, physical activity and lifestyle, and nutrition knowledge sections. However in the gender based classification, only two significant differences were determined between males (n=170) and females (n=214) in dietary beliefs and nutrition knowledge sections. All results regarding students' scores in all students' samples with their significant differences can be shown clearly in Tables 17 and 18.

Table 16: Categorical PA scores for Lebanese university Students according to Gender and specification.

Continuous Level of PA	Sport Males		Sport females		Non-sport males		Non-sport females		Total Leb. Sample	
High PA Level	N	%	N	%	N	%	N	%	N	%
Criterion 1: > 3 days at least 1500 Mets	12	12%	15	15%	2.0	2.9%	11	9.6%	40	10.5
Criterion 2: 5 days of any combination VPA/MPA/Walking with at least 3000 METS	20	20%	14	14%	4.0	5.7%	12	10.5%	50	13
Total High PA Level	32	32%	29	29%	6.0	8.6%	23	20.1%	90	23.5%
Moderate PA Level										
Criterion 1: 3 days of VPA of at least 20 minutes/day	9.0	9%	9.0	9%	2.0	2.9%	8.0	7%	28	7.3
Criterion 2: 5 days of MPA activity or walking of > 30 minutes/day for > 10 minutes at a time	31	31%	25	25%	7.0	10%	9.0	7.9%	72	18.8
Criterion 3: 5 days of any combination of walking, MPA or VPA activities achieving at least 600 MET-minutes/weeks	5.0	5%	6.0	6%	2.0	2.9%	4.0	3.5%	17	4.4
Total Moderate PA Level	45	45%	40	40%	11	16.2%	21	18.5%	117	30.5%
Low PA Level										
Meets neither 'moderate' nor 'high' criteria	23	23%	31	31%	52	75%	71	62.3%	177	46%

Table 17: Mean Scores of the Nutrition Survey sections by Gender- Mann-Whitney U Test

	Questionnaire Section	Scores	Males (170)	Females (214)	p value
1	Dietary Habits Total Score 52	Lowest	22.8	21.3	
		Mean	**35.8**	**35.1**	**.228**
		Highest	47	44.6	
2	Physical Activity and Lifestyle- Total Score 24	Lowest	9.0	11.5	
		Mean	**16**	**16.2**	**.519**
		Highest	19	18.1	
3	Dietary beliefs Total Score 12	Lowest	7.0	8.3	
		Mean	**8.9**	**9.3**	**.031**
		Highest	10	11.1	
4	Nutrition Knowledge Total Score 11	Lowest	5.4	2.0	
		Mean	**6.7**	**6.3**	**.016**
		Highest	9.0	10.1	

Table 18: Mean Scores of the Nutrition Survey sections by Major- Mann-Whitney U Test

	Questionnaire Section	Scores	Sport sample (200)	Non-sport sample (184)	p value
1	Dietary Habits Total Score 52	Lowest	20.3	23.3	
		Mean	36.3	34.7	**0.000**
		Highest	46.2	45.1	
2	Physical Activity and Lifestyle- Total Score 24	Lowest	9.7	11.1	
		Mean	18.3	13.7	**0.000**
		Highest	22.3	18.0	
3	Dietary beliefs Total Score 12	Lowest	7.0	8.0	
		Mean	9.3	8.9	0.065
		Highest	11	10.2	
4	Nutrition Knowledge Total Score 11	Lowest	3.3	3.7	
		Mean	6.4	6.7	**0.033**
		Highest	9.5	9.0	

Dietary habits

The mean total score for this section was 52. Regarding university specification, sport major students showed healthier eating habits since the mean score of the physical education and sports students was 36.3 while the non-sport sample students' mean was 34.7 with significant difference between both samples (p=.000). As for gender classification, Both male and female genders showed similar close results scoring 35.8 and 35.1 as mean scores respectively with no significant difference (p=.228). The dietary habits section results were shown in Tables 17 and 18.

In the PE and Sport sample, females were found to be following healthier eating habits than males. For example, the day-to-day breakfast consumption was reported by 65% of females and 61% of males without a significant differences between samples' means. Consumption of beverages at breakfast reported consuming milk/coffee/ yogurt at breakfast by 39% of males and 33% of females while one-quarter of the students reported consumption of fruit juice. Breakfast content reported consuming biscuits, cakes, crackers, breakfast cereals, and bread by most of the students (65% males, and 50% females) while around one third of both samples (22% males, and 33% females) reported consuming fruits at breakfast. Almost one third of the students reported frequent consumption of at least two portions of fruits per day (27% males, and 34% females) while females were healthier at consuming vegetables by 62% to 38% of males. Sweets/cakes at meals were occasionally consumed by students of both male and female genders (56% vs 57%, respectively) (p=.527). Regular three meals per day consumption was reported by 51% of the males and 59% of females. Daily water consumption of at least 1–1.5L was reported by most females (66%) and males (81%) with a gender significant difference (p= .019).

In the non-sport sample, around half males (46%) and half females (43%) reported regular daily breakfast intake with no significant difference between samples' means (p=.286). Breakfast content reported consuming biscuits, cakes, crackers, breakfast cereals, and bread by half of females (56%) while half of males (43%) reported consuming fruits at breakfast. Almost one quarter of non-sport students reported frequent consumption of at least two portions of fruits per day (20% males, and 19% females). Females were healthier at consuming vegetables by 31% to 20% of males. Regarding consuming sweets/cakes at meals, results showed rarely consumed by students of both male and female genders (6% vs 2%, respectively). Regular three meals per day consumption was reported by 37% of both genders. Daily water consumption of at least 1–1.5L was reported by almost half females (46%) and most males (67%) with a gender significant difference (.001).

Physical activity and lifestyle

Outcomes of this section indicated that the students of sport major were high physically active, while the non-sport major students were slightly above average. The mean total score for this section was 24. The sport major students mean score was 18.3, while the mean score for the non-sport major students was 13.7 with a clear significant difference between both majors (p=.000) (Table 18). In addition, the gender based classification in this section showed that both genders were equally active since male

students (n=170) have scored a mean of 16 while females (n=214) had a mean score of 16.2 (p=.519) (Table 17).

In the Major based classification, most sport major students (79%) reported practicing physical activity during the entire year, and 64% of them reported practicing more than 4h per week. Around half of them rated their lifestyle from moderately active (40.5%) to very active (48.5%). However in non-sport sample (n=184), (11%) reported practicing physical activity during the entire year and only (7%) of them reported practicing more than 4h per week. (38.5% and 6.5%) of the non-sport students rated their lifestyle between moderately active to very active respectively.

Regarding the gender based classification; most male students (79%) and almost all female students (99%) reported practicing physical activity during the entire year, 78% of males and 62% of females reported practicing more than 4h per week. Around one third of male students (28% and 34%) rated their lifestyle from moderately active to very active respectively, while (49% and 24%) of female students rated their lifestyle from moderately active to very active respectively.

Dietary beliefs

Results of this section indicated that students have sufficient comprehension of the meaning of a healthy diet, especially females. The total score for this section was 12 and the mean score for females was 8.9 for males and 9.3 for females. Sport major students showed more nutrition awareness scoring a mean of 9.3 while non-sport major students scored a mean of 8.9 with no significant difference between both majors (p= .065) (Tables 17-18). Students responded correctly to the three questions related to the meaning of a healthy diet in all sample groups. For instance, in university major classification, and in response to the question according to you, which is a healthy diet? 75% of sport major students and 63% of non-sport major students chose the correct answer (a diet rich in different foods), and in response to another question according to you, which is the healthiest eating behavior? Around half of sport major students (44%) and on third of non-sport major students (24%) chose the correct answer (drinking two glasses of milk/eating two cups of yogurt every day). Regarding the cooking method, around two thirds (61%) of sport students and one third of non-sport students (34%) chose grilling/boiling as the healthiest option.

Nutritional knowledge

The total score for the nutritional knowledge section was 11 and the mean score for females was 6.3 and for males was 6.7 where there was a statistically significant difference in questions' responses between genders (p=.016). Males reported better nutritional knowledge on questions related to foods rich in dietary fibers, foods low in fat, foods rich in protein, different food substances containing energy, functions of vitamins and minerals, and on questions related to the "definition" of daily energy expenditure.

Major based classification of this dietary section showed that the non-sport student sample have higher nutritional knowledge than their sport colleagues. The

mean score for the non-sport sample was 6.7 while the sport sample scored 6.4 establishing a statistically significant difference in questions' responses between both majors (p=.033) (Tables 17-18).

6.2.3. Independent t-test determining the significant differences in body composition based on gender and university specialization

The t-test analysis revealed significant differences in body composition between genders within both university specializations. Regarding the sport students' sample (samples 1-2), significant differences were detected in all primary (BH, BM, BFM,SMM, and TBW) and derived (BMI, PBFM, BFMI, PSMM, SMMI, IH, FMI) body composition variables where males were found heavier, taller, with higher BMI average, higher SMM, PSMM, SMMI, TBW, FMI, while females scored higher averages in BFM, PBFM, BFMI, and IH. The gender-based classification among the non-sport sample (samples 3-4) indicated significant differences between genders in all variables except in PBFM where males scored slightly higher averages than females.

The t-test of university specialization classification for males showed significant difference between sport males and non-sport males in most variables except BH, and PSMM. However, females of both specializations showed significant differences in most variables except BH, SMM, SMMI, and IH. Results of the t-test including all significant differences were shown in Tables 19, 20, 21 and 22.

Table 19: Differences in body composition based on gender of the sport sample

Variables	t	df	p	MD	SED	95% CID	
						Lower	Upper
BW (kg)	13.49	198	.000	16.49	1.22	14.08	18.90
BH (cm)	14.71	198	.000	12.91	.87	11.18	14.63
BMI (kg/m^2)	6.87	198	.000	2.28	.33	1.62	2.93
BFM (kg)	-5.28	198	.000	-3.29	.62	-4.52	-2.06
PBFM (%)	-12.68	198	.000	-9.18	.72	-10.61	-7.75
BFMI (index unit)	-8.12	198	.000	-1.69	.20	-2.10	-1.28
SMM (kg)	16.81	198	.000	20.85	1.24	18.41	23.30
PSMM (%)	21.85	198	.000	18.36	.84	16.70	20.02
SMMI (index unit)	15.86	198	.000	5.31	.33	4.65	5.97
TBW	8.65	198	.000	6.07	.70	4.69	7.46
IH (index unit)	-19.07	198	.000	-.49	.02	-.54	-.43
MFI (index unit)	15.99	198	.000	3.55	.22	3.11	3.99

MD – Mean Difference, SED – Standard Error of the Difference, CID – Confidence Interval.

Table 20: Differences in body composition based on gender of the non- sport sample

Variable	t	df	p	MD	SED	95% CID	
						Lower	Upper
BW	12.45	182	.000	27.71	2.23	23.30	32.13
BH	14.82	182	.000	0.14	0.01	0.12	0.16
BMI	8.03	182	.000	5.40	0.67	4.07	6.73
BFM	5.28	182	.000	7.10	1.34	4.43	9.76
PBFM	0.19	182	.852	0.21	1.15	-2.06	2.49
BFMI	3.29	182	.001	1.43	0.43	0.57	2.29
SMM	16.44	182	.000	28.73	1.74	25.28	32.18
PSMM	22.13	182	.000	18.81	.84	17.13	20.48
SMMI	14.85	182	.000	7.63	.51	6.62	8.65
TBW	-2.69	182	.008	-2.74	1.02	-4.77	-0.72
IH	-5.63	182	.000	-0.19	0.03	-0.26	-0.13
MFI	5.50	182	.000	.94	.17	.60	1.28

MD – Mean Difference, SED – Standard Error of the Difference, CID – Confidence Interval.

Table 21: Differences in Body composition for male students based on university specialization

Variable	t	df	p	MD	SED	95% CID	
						Lower	Upper
BW	-6.46	168	.000	-14.52	2.25	-18.98	-10.07
BH	-0.20	168	.844	0.00	0.01	-0.02	0.02
BMI	-7.22	168	.000	-4.61	0.64	-5.88	-3.34
BFM	-10.46	168	.000	-13.18	1.26	-15.69	-10.68
PBFM	-12.15	168	.000	-12.29	1.01	-14.30	-10.29
BFMI	-10.68	168	.000	-4.21	0.39	-5.00	-3.43
SMM	-4.166	168	.000	-9.11	2.18	-13.428	-4.792
PSMM	.033	168	.973	.040	1.20	-2.343	2.424
SMMI	-4.81	168	.000	-2.897	.602	-4.085	-1.708
TBW	11.57	168	.000	12.13	1.05	10.05	14.21
IH	-12.36	168	.000	-0.35	0.03	-0.40	-0.29
MFI	9.36	168	.000	2.81	0.3	2.225	3.413

MD – Mean Difference, SED – Standard Error of the Difference, CID – Confidence Interval

Table 22: Differences in Body composition for female students based on specialization

Variable	t	df	p	MD	SED	95% CID	
						Lower	Upper
BW	-2.80	212	.006	-3.31	1.18	-5.64	-0.98
BH	1.53	212	.128	0.01	0.01	0.00	0.03
BMI	-3.80	212	.000	-1.49	0.39	-2.27	-0.72
BFM	-3.59	212	.000	-2.79	0.78	-4.32	-1.26
PBFM	-3.16	212	.002	-2.89	0.92	-4.70	-1.09
BFMI	-3.93	212	.000	-1.09	0.28	-1.64	-0.54
SMM	-1.66	212	.098	-1.23	0.74	-2.69	0.23
PSMM	1.01	212	.309	0.48	0.47	-0.45	1.43
SMMI	-2.32	212	.021	-0.57	0.24	-1.06	-0.08
TBW	5.04	212	.000	3.31	0.66	2.02	4.61
IH	-1.72	212	.087	-0.05	0.03	-0.11	0.01
MFI	2.27	212	.024	0.20	0.09	0.02	0.38

MD – Mean Difference, SED – Standard Error of the Difference, CID – Confidence Interval

6.2.4. Pearson Correlations

Pearson correlation analyses discovered multiple relations between the body composition measures and dietary habits, and between body composition measures and physical Activity levels.

The greatest influence on body composition represented by their correlations with physical activity and Dietary habits variables among the four students' samples were as follows: minutes of walking per week showed (low positive and negative influence on 9 BC variables) in sample two (Sport female students). In the same sample, sedentary life style represented by minutes of sitting per week showed also (low positive and negative influence on 9 BC variables). On the other hand, Consuming pizzeria per week showed (low positive and negative influence on 6 BC variables) in sample 1 (sport male students). Consuming sweets per week showed a (low positive and negative influence on 9 BC variables) in sample 2 (female sport students), and (low positive and negative influence on 7 BC variables) in sample 4, (Female non-sport students). Moreover, Consuming meat per week showed (low positive and negative influence on 8 BC variables) in sample 3 (non-sport male students). In sample 2 (females sport students), Beverages at breakfast displayed (low positive and negative influence on 9 BC variables), while Eating vegetables per day displayed (low positive and negative influence on 8 BC variables) in the same sample. Finally, the greatest influence of dietary habit on body composition was shown in sample four (female non-sport students) where 11 body composition variables carried positive and negative influence by diet content. All correlation results among the four students' samples were presented clearly in Tables (23 to 34).

6.2.4.1. **Sample 1: Male Sport students sample**

A- Associations of Body Composition variables with Physical activity variables

Table 23: Pearson Correlation Coefficients for Body Composition indices and Physical Activity indices in male sport sample group.

Variable	VPA (M/W)	VPA (D/W)	MPA (M/W)	MPA (D/W)	Walking (M/W)	Walking (D/W)	Sitting (M/W)
BW	0.007	0.025	-0.095	-0.061	0.121	0.025	-0.083
BH	0.012	-0.009	0.042	-0.006	0.037	0.034	0.092
BMI	-0.012	0.031	-0.156	-0.080	0.133	0.001	-0.163
BFM	-0.103	-0.076	-0.052	-0.051	0.083	-0.048	-0.024
PBFM	-0.131	-0.113	-0.048	-0.057	0.034	-0.110	0.025
BFMI	-0.124	-0.089	-0.066	-0.057	0.067	-0.076	-0.030
SMM	0.022	0.061	-0.082	-0.057	0.083	0.037	-0.051
PSMM	0.024	0.084	0.064	0.032	-0.091	0.050	0.078
SMMI	0.009	0.088	-0.147	-0.078	0.091	0.026	-0.136
TBW	0.118	0.126	0.032	0.062	-0.011	0.119	-0.083
IH	-0.129	-0.139	-0.013	-0.048	0.002	-0.138	0.094
MFI	0.072	0.112	0.029	0.028	-0.021	0.129	-0.022
Sig. Correlations	0	0	0	0	0	0	0

Values: r (Pearson correlation coefficient). * $p < 0.05$; ** $p < 0.0$

B- Associations of Body Composition variables with Nutrition Variables

Table 24: Pearson Correlation Coefficients for Body Composition indices and Frequency of Food consumption indices in male sport sample group.

Variable	Meat/ week	Fish/ week	eggs/ week	cheese/ week	Ham,Salami,Sausages/ week	legumes / week	sweets/ week	fried potato /week	Fast food /week	pizzeria / week
BW	-0.104	0.108	-0.018	0.033	0.051	-0.002	-0.122	0.007	0.115	0.186
BH	-0.114	0.157	0.001	-0.035	0.106	0.114	0.020	0.041	0.078	0.082
BMI	-0.046	0.040	-0.019	0.071	0.000	-0.096	-0.180	-0.024	0.099	0.193
BFM	-0.091	0.026	-0.051	0.076	0.056	-0.075	-0.097	-0.071	0.078	**.271****
PBFM	-0.060	0.005	-0.038	0.084	0.065	-0.098	-0.113	-0.107	0.062	**.288****
BFMI	-0.064	0.009	-0.047	0.093	0.050	-0.116	-0.120	-0.085	0.070	**.283****
SMM	-0.089	0.130	0.000	0.055	0.080	0.043	-0.096	0.061	0.077	0.103
PSMM	0.026	0.015	0.040	0.063	0.059	0.114	0.117	0.148	-0.125	**-.226***
SMMI	-0.030	0.060	0.006	0.113	0.034	-0.034	-0.149	0.056	0.040	0.082
TBW	0.087	-0.119	0.058	0.052	-0.006	0.033	0.147	0.075	-0.047	-0.166
IH	-0.052	-0.007	-0.024	0.071	0.076	-0.069	-0.086	-0.128	0.041	**.276****
MFI	0.036	-0.010	0.020	-0.060	-0.010	0.079	**.232***	0.101	-0.035	**-.263****
Sig. Correlations	0	0	0	0	0	0	1	0	0	6

Values: r (Pearson correlation coefficient). * $p < 0.05$; ** $p < 0.01$.

Table 25: Pearson Correlation Coefficients for Body Composition indices and Dietary Habits indices in male sport sample group.

Variable	eating breakfast	Beverages at breakfast	breakfast content	fruit/ day	vegies/day	Cake/dessert at meals	three meals daily	diet type	diet content	snacks content	beverages between meals	milk or yogurt/ [illegible]	mineral water day
BW	**-.200***	-0.015	0.044	0.136	0.010	0.026	-0.163	0.057	-0.094	0.169	-0.052	0.030	0.011
BH	0.006	-0.070	-0.031	0.170	0.024	0.141	-0.013	0.099	-0.186	0.024	-0.036	0.078	**.239***
BMI	**-.261****	0.017	0.084	0.065	-0.013	-0.076	**-.200***	-0.001	0.009	0.193	-0.036	-0.014	-0.165
BFM	**-.203***	0.123	0.037	0.026	-0.101	-0.068	-0.150	0.058	-0.121	-0.023	0.076	0.031	-0.177
PBFM	-0.180	0.135	0.041	-0.022	-0.133	-0.109	-0.143	0.053	-0.118	-0.098	0.135	0.049	**-.221***
BFMI	**-.211***	0.123	0.051	-0.003	-0.113	-0.101	-0.160	0.041	-0.093	-0.036	0.098	0.025	-.233*
SMM	-0.104	-0.091	0.054	0.127	0.053	0.109	-0.090	0.046	-0.059	0.177	-0.105	0.038	0.083
PSMM	**.273****	-0.164	0.016	-0.053	0.101	**.220***	**.226***	-0.047	0.094	-0.034	-0.132	0.007	0.148
SMMI	-0.133	-0.084	0.107	0.045	0.046	0.035	-0.096	-0.027	0.071	**.208***	-0.113	-0.005	-0.091
TBW	0.155	-0.093	-0.020	-0.075	0.054	0.150	0.127	0.037	0.101	0.057	**-.220***	-0.132	0.096
IH	-0.118	0.139	0.028	-0.038	-0.144	-0.113	-0.102	0.066	-0.142	-0.180	0.177	0.076	-0.192
MFI	0.157	-0.101	-0.048	-0.020	0.065	0.158	0.132	-0.062	0.061	0.058	-0.193	-0.099	**.216***
Sig. Correlation	5	0	0	0	0	1	2	0	0	1	1	0	3

Values: r (Pearson correlation coefficient). * $p < 0.05$; ** $p < 0.01$.

6.2.4.2. **Sample 2: Female Sport students sample**

A- Associations of Body Composition variables with Physical activity variables

Table 26: Pearson Correlation Coefficients for Body Composition indices and Physical Activity indices in female sport sample group.

Variable	VPA (M/W)	VPA (D/W)	MPA (M/W)	MPA (D/W)	Walking (M/W)	Walking (D/W)	Sitting (M/W)
BW	0.083	0.082	-0.059	-0.064	**.270****	**.227***	**.270****
BH	0.163	0.180	0.070	0.004	-0.062	-0.038	-0.062
BMI	-0.013	-0.024	-0.117	-0.087	**.357****	**.278****	**.357****
BFM	-0.002	0.025	-0.050	-0.024	**.338****	**.275****	**.338****
PBFM	-0.058	-0.034	-0.059	-0.024	**.330****	**.260****	**.330****
BFMI	-0.032	-0.004	-0.067	-0.031	**.375****	**.290****	**.375****
SMM	0.121	0.102	-0.007	-0.011	0.134	**.257****	0.134
PSMM	0.011	0.015	0.079	0.095	**-.224***	-0.049	**-.224***
SMMI	-0.026	-0.061	-0.077	-0.026	0.189	**.295****	0.189
TBW	0.195	0.146	0.133	0.067	**-.223***	-0.093	**-.223***
IH	-0.086	-0.059	-0.028	0.003	**.235***	0.192	**.235***
MFI	0.053	0.054	0.043	0.021	**-.281****	-0.191	**-.281****
Sig. Correlation	0	0	0	0	9	7	9

Values: r (Pearson correlation coefficient). * $p < 0.05$; ** $p < 0.01$.

B- Associations of Body Composition variables with Nutrition Variables

Table 27: Pearson Correlation Coefficients for Body Composition indices and Frequency of Food consumption indices in female sport sample group.

Variable	meat/ week	fish/ week	eggs/ week	cheese/ week	Ham,Salami,Sausag	legumes/ week	sweets/ week	fried potato	fast food/ week	pizzeria/ week
BW	0.007	**.238***	0.177	-0.021	-0.032	-0.163	**.246***	0.005	0.005	-0.159
BH	**.219***	0.091	**.361****	**.227***	**.266****	0.031	0.029	**.198***	-0.149	-0.179
BMI	-0.128	**.221***	-0.022	-0.157	**-.198***	**-.205***	**.279****	-0.131	0.101	-0.053
BFM	-0.042	**.230***	0.168	-0.068	-0.086	-0.176	**.314****	-0.028	0.059	-0.078
PBFM	-0.034	**.210***	0.132	-0.102	-0.100	-0.171	**.335****	-0.046	0.094	-0.007
BFMI	-0.082	**.230***	0.114	-0.106	-0.134	-0.188	**.333****	-0.071	0.093	-0.038
SMM	0.075	0.148	0.102	-0.043	0.141	-0.151	0.032	0.069	**-.293****	-0.089
PSMM	0.012	-0.190	-0.140	-0.007	0.151	0.078	**-.312****	0.064	**-.273****	0.107
SMMI	-0.119	0.072	**-.216***	**-.236***	-0.084	-0.179	0.010	-0.110	-0.178	0.074
TBW	0.148	-0.117	-0.023	0.053	0.183	**.198***	**-.265****	0.085	-0.147	-0.031
IH	0.028	0.149	0.167	-0.065	-0.038	-0.128	**.298****	0.004	0.077	0.031
MFI	-0.006	-0.179	-0.087	0.132	0.109	0.144	**-.306****	0.018	-0.135	0.004
Sig. Correlation	1	4	2	2	2	2	9	1	2	0

Values: r (Pearson correlation coefficient). * $p < 0.05$; ** $p < 0.01$.

Table 28: Pearson Correlation Coefficients for Body Composition indices and Dietary Habits indices in female sport sample group.

Variable	eating breakfast	Beverages at breakfast	breakfast content	fruits/ day	vegetables/ day	cake/dessert at meals	Three meals daily	diet type	diet content	snacks content	Beverages between meals	Milk or yogurt/day	mineral water/ day
BW	0.072	**-.412****	**-.274****	0.056	-0.120	**.215***	-0.014	-0.173	**.266****	0.044	-0.104	0.169	0.148
BH	0.015	-0.124	**-.375****	**.203***	**.289****	-0.086	0.060	-0.116	**.439****	-0.030	-0.140	**.217***	0.131
BMI	0.070	**-.381****	-0.072	-0.045	**-.318****	**.308****	-0.059	-0.129	0.037	0.064	-0.026	0.065	0.090
BFM	-0.005	**-.394****	**-.232***	0.005	**-.203***	**.197***	0.021	-0.132	0.158	-0.010	-0.095	0.150	0.169
PBFM	-0.044	**-.344****	-0.188	-0.025	**-.242***	**.221***	0.025	-0.090	0.077	-0.038	-0.068	0.106	0.178
BFMI	-0.013	**-.382****	-0.172	-0.012	**-.257****	**.226***	0.004	-0.115	0.097	-0.006	-0.071	0.122	0.156
SMM	-0.024	**-.394****	-0.187	0.030	0.170	0.109	-0.171	-0.151	**.248***	0.174	-0.020	0.116	0.117
PSMM	-0.130	0.184	**.199***	-0.060	**.328****	**-.236***	-0.122	0.087	-0.126	0.111	0.118	-0.105	-0.089
SMMI	-0.040	**-.282****	0.143	-0.141	-0.075	0.188	**-.230***	-0.058	-0.131	**.205***	0.112	-0.065	0.011
TBW	0.092	0.137	0.110	0.186	**.370****	-0.094	-0.097	0.186	0.006	0.125	-0.073	-0.150	-0.187
IH	-0.098	**-.245***	**-.201***	-0.027	-0.173	0.155	0.065	-0.041	0.065	-0.079	-0.064	0.098	**.202***
MFI	0.017	**.283****	0.179	0.035	**.274****	**-.254***	-0.030	0.045	-0.059	0.065	0.063	-0.050	**-.216***
Sig. Correlations	0	9	5	1	8	7	1	0	3	1	0	1	2

Values: r (Pearson correlation coefficient). * $p < 0.05$; ** $p < 0.01$.

6.2.4.3. **Sample 3: Male non-sport students sample**

A- Associations of Body Composition variables with Physical activity variables

Table 29: Pearson Correlation Coefficients for Body Composition indices and Physical Activity indices in male non-sport sample group.

Variable	VPA (M/W)	VPA (D/W)	MPA (M/W)	MPA (D/W)	Walking (M/W)	Walking (D/W)	Sitting (M/W)
BW	0.032	0.010	0.038	0.024	-0.022	-0.092	0.222
BH	-0.129	-0.075	0.024	-0.008	-0.092	-0.095	-0.076
BMI	0.089	0.037	0.029	0.033	0.006	-0.073	**.279***
BFM	0.048	0.007	-0.082	-0.083	-0.048	-0.142	**.333****
PBFM	0.059	0.007	-0.128	-0.120	-0.072	-0.175	**.331****
BFMI	0.070	0.015	-0.086	-0.078	-0.043	-0.143	**.357****
SMM	0.031	0.015	0.194	0.167	0.020	-0.014	0.039
PSMM	-0.029	-0.002	0.125	0.117	0.064	0.145	**-.295***
SMMI	0.120	0.063	0.206	0.206	0.081	0.041	0.099
TBW	-0.003	0.058	0.114	0.116	0.106	0.199	-0.092
IH	0.038	0.005	-0.194	-0.193	-0.108	-0.193	0.224
MFI	-0.055	-0.025	0.020	0.004	0.005	0.079	-0.108
Sig. Correlations	0	0	0	0	0	0	5

Values: r (Pearson correlation coefficient). * $p < 0.05$; ** $p < 0.01$.

B- Associations of Body Composition variables with Nutrition Variables

Table 30: Pearson Correlation Coefficients for Body Composition indices and Frequency of Food consumption indices in male non-sport sample group.

Variable	meat/ week	Fish/ week	eggs/ week	cheese/ week	Ham,Salami,Sausage/ week	legumes/ week	sweets/ week	fried potato /week	fast food /week	pizzeria/ week
BW	**-.243***	0.146	0.068	0.043	-0.019	0.182	-0.155	0.211	-0.092	-0.033
BH	**-.287***	0.040	-0.061	0.144	-0.023	-0.013	-0.119	0.166	0.005	0.044
BMI	-0.153	0.117	0.091	-0.028	-0.015	0.212	-0.120	0.142	-0.092	-0.042
BFM	**-.286***	0.102	0.056	-0.020	-0.075	**.253***	**-.245***	0.138	-0.068	-0.043
PBFM	**-.281***	0.092	0.043	-0.070	-0.103	**.280***	**-.274***	0.038	-0.080	0.001
BFMI	**-.257***	0.078	0.059	-0.061	-0.073	**.268***	-0.234	0.097	-0.060	-0.041
SMM	-0.100	0.172	0.076	0.161	0.040	0.073	-0.015	0.215	-0.048	0.041
PSMM	**.288***	-0.095	-0.041	0.123	0.069	-0.235	0.232	-0.081	0.152	0.078
SMMI	0.074	0.150	0.124	0.083	0.057	0.093	0.069	0.128	-0.056	0.029
TBW	**.282***	0.089	-0.010	**.379****	0.105	-0.149	**.314****	**.259***	0.038	0.029
IH	**-.269***	0.060	-0.008	-0.051	-0.151	**.246***	**-.294***	-0.074	-0.042	0.095
MFI	0.126	-0.203	-0.043	-0.046	0.131	-0.192	0.091	-0.005	0.148	-0.086
Sig. Correlation	8	0	0	1	0	4	4	1	0	0

Values: r (Pearson correlation coefficient). * $p < 0.05$; ** $p < 0.01$.

Table 31: Pearson Correlation Coefficients for Body Composition indices and Dietary Habits indices in male non-sport sample group.

Variable	eating breakfast	bevarages at breakfast	breakfast content	Fruit/Day	Vegetables/ Day	cake/ dessert at meals	three meals daily	diet type	diet content	snacks content	Beverages between	Milk or Yogurt/Day	Mineral Water/Day
BW	-0.109	0.028	0.105	0.101	0.041	-0.065	-0.054	-0.022	**-.237***	0.029	**-.275***	0.119	**-.304***
BH	-0.004	**.253***	-0.031	0.003	-0.107	0.026	0.125	-0.099	-0.126	-0.060	-0.126	-0.144	-0.187
BMI	-0.104	-0.077	0.135	0.098	0.079	-0.112	-0.102	0.021	-0.189	0.053	-0.226	0.201	**-.236***
BFM	-0.026	-0.022	0.185	0.081	0.053	-0.170	-0.043	-0.064	-0.234	0.103	**-.248***	0.203	**-.258***
PBFM	0.033	-0.064	**.260***	0.031	0.035	**-.258***	-0.018	-0.070	-0.172	0.143	-0.166	**.280***	-0.158
BFMI	-0.016	-0.063	0.204	0.075	0.065	-0.207	-0.060	-0.049	-0.204	0.109	-0.214	**.235***	-0.222
SMM	-0.229	0.131	0.026	0.031	-0.050	0.100	-0.035	0.025	-0.135	-0.069	**-.249***	-0.042	**-.288***
PSMM	-0.080	0.116	-0.185	-0.125	-0.127	**.261***	0.047	0.044	0.220	-0.123	0.156	**-.273***	0.156
SMMI	**-.254***	-0.028	0.049	0.026	0.005	0.075	-0.116	0.105	-0.063	-0.040	-0.189	0.068	-0.189
TBW	**-.247***	0.015	**-.301***	0.041	-0.077	**.297***	0.041	**.256***	-0.156	-0.212	-0.046	-0.200	-0.086
IH	0.104	-0.034	**.303***	-0.090	-0.068	**-.277***	0.077	-0.131	-0.067	0.180	-0.046	**.312****	-0.014
MFI	-0.025	0.083	**-.255***	0.101	0.017	0.134	-0.076	-0.021	0.137	-0.072	0.118	**-.289***	0.079
Sig. Correlation	2	1	4	0	0	4	0	1	1	0	3	5	4

Values: r (Pearson correlation coefficient). * $p < 0.05$; ** $p < 0.01$.

6.2.4.4. **Sample 4: Female non-sport students sample**

A - Associations of Body Composition variables with Physical activity variables

Table 32: Pearson Correlation Coefficients for Body Composition indices and Physical Activity indices in female non-sport sample group.

Variable	VPA (M/W)	VPA (D/W)	MPA (M/W)	MPA (D/W)	Walking (M/W)	Walking (D/W)	Sitting (M/W)
BW	0.004	-0.030	0.155	0.114	-0.016	-0.118	-0.043
BH	0.014	0.023	0.016	-0.044	-0.046	-0.184	**.262****
BMI	-0.010	-0.055	0.148	0.136	-0.019	-0.069	-0.153
BFM	0.012	-0.042	0.175	0.118	-0.010	-0.122	-0.044
PBFM	-0.009	-0.068	0.156	0.104	-0.054	-0.151	-0.059
BFMI	0.015	-0.045	**.186***	0.136	-0.011	-0.104	-0.085
SMM	-0.041	-0.064	0.136	0.164	-0.093	**-.186***	0.091
PSMM	-0.024	0.005	-0.144	-0.065	-0.013	0.062	0.136
SMMI	-0.042	-0.073	0.131	**.209***	-0.059	-0.050	-0.111
TBW	0.048	0.110	-0.136	-0.114	0.089	0.179	0.041
IH	-0.015	-0.062	0.130	0.070	-0.087	**-.188***	-0.012
MFI	-0.015	0.021	**-.202***	-0.142	0.034	0.088	0.136
Sig. Correlation	0	0	2	1	0	2	1

Values: r (Pearson correlation coefficient). * $p < 0.05$; ** $p < 0.01$.

B- Associations of Body Composition variables with Nutrition Variables

Table 33: Pearson Correlation Coefficients for Body Composition indices and Frequency of Food consumption indices in female non-sport sample group.

Variable	meat/ week	Fish/ week	eggs/ week	Cheese /week	Ham,Salami ,Sausages/ week	legumes /week	sweets/ week	fried potato /week	fast food /week	pizzeria /week
BW	0.084	-0.081	0.121	0.110	0.095	0.088	**.198***	**-.184***	-0.117	-0.014
BH	**.197***	-0.011	0.025	**.191***	0.016	-0.009	**.216***	-0.097	0.007	0.157
BMI	0.012	-0.080	0.123	0.054	0.100	0.090	0.128	-0.175	-0.136	-0.076
BFM	0.040	-0.007	0.146	0.113	0.139	0.105	**.206***	-0.172	-0.064	0.005
PBFM	0.028	0.049	0.142	0.104	0.157	0.093	**.200***	-0.165	-0.032	-0.002
BFMI	0.006	0.002	0.148	0.096	0.140	0.113	0.182	-0.183	-0.079	-0.020
SMM	0.127	-0.101	0.138	**.235***	0.059	0.069	0.157	-0.106	-0.080	0.080
PSMM	-0.026	0.018	-0.083	0.001	-0.101	-0.079	-0.173	**.198***	0.109	0.095
SMMI	-0.024	-0.090	0.125	0.097	0.049	0.075	-0.014	-0.046	-0.098	-0.042
TBW	-0.041	-0.035	-0.091	-0.135	-0.148	-0.085	**-.215***	0.124	-0.039	-0.043
IH	0.044	0.129	0.110	0.100	0.155	0.053	**.197***	-0.126	0.045	0.019
MFI	-0.024	-0.077	-0.124	-0.051	-0.144	-0.041	**-.188***	0.157	-0.002	0.064
Sig. Correlation	1	0	0	2	0	0	7	2	0	0

Values: r (Pearson correlation coefficient). * $p < 0.05$; ** $p < 0.01$.

Table 34: Pearson Correlation Coefficients for Body Composition indices and Dietary Habits indices in female non-sport sample group.

Variable	eating breakfast	bevarages at breakfast	breakfast content	Fruits/Day	Vegetables/ Week	cake/dessert at meals	three meals daily	diet type	diet content	snacks content	beverages between	Milk or yogurt/day	Mineral Water/Day
BW	-0.092	-0.070	-0.106	0.009	-0.024	0.184	-0.088	-0.090	**.301****	-0.177	-0.099	0.107	-0.100
BH	-0.007	-0.144	-0.081	-0.107	-0.137	0.119	0.086	-0.091	**.352****	-0.113	-0.115	0.081	-0.181
BMI	-0.100	-0.028	-0.082	0.055	0.029	0.157	-0.129	-0.073	**.190***	-0.145	-0.058	0.093	-0.033
BFM	-0.054	-0.040	-0.109	0.013	0.016	**.274****	-0.054	-0.129	**.325****	-0.142	-0.059	0.099	-0.079
PBFM	-0.058	-0.034	-0.101	-0.006	0.013	**.296****	-0.043	-0.168	**.317****	-0.118	-0.039	0.084	-0.075
BFMI	-0.059	-0.018	-0.110	0.027	0.034	**.272****	-0.068	-0.136	**.290****	-0.121	-0.038	0.097	-0.054
SMM	-0.060	-0.104	-0.047	0.074	0.026	**.209***	-0.042	-0.136	**.293****	-0.113	**-.247****	-0.017	-0.065
PSMM	0.122	0.025	0.126	0.058	0.057	-0.141	0.113	0.073	**-.235***	0.169	-0.018	-0.149	0.111
SMMI	-0.061	0.014	0.019	0.158	0.127	0.123	-0.111	-0.076	0.039	-0.034	-0.156	-0.075	0.078
TBW	0.031	0.095	0.108	0.059	0.003	**-.356****	0.015	**.236***	**-.315****	0.093	0.044	-0.031	0.066
IH	-0.044	-0.047	-0.080	-0.065	-0.018	**.316****	0.017	**-.207***	**.328****	-0.086	-0.010	0.068	-0.095
MFI	0.134	0.018	0.089	0.074	0.058	**-.224***	0.058	0.176	**-.258****	0.133	0.014	-0.091	0.103
Sig Correlations	0	0	0	0	0	7	0	2	11	0	1	0	0

Values: r (Pearson correlation coefficient). * $p < 0.05$; ** $p < 0.01$.

6.2.5. Chi-square for Physical Activity and Nutrition variables

The Chi-square technique found significant differences between the expected and observed numbers of students in both physical activity variables including VPA, MPA, and walking activity, and nutrition variables including questions of section B - Frequency of food consumption.

Around half of Lebanese students (44%, n=172) were achieving the (WHO) recommended minutes per week of VPA (75 min/week), while around one third of them (20%, n=78) were achieving the recommended level of MPA (150 min/week), and one third of them (33%, n=125) were fulfilling the recommended level of walking per week. Regarding nutrition variables, the frequency of healthy food consumption by the Lebanese universities students were found below the 4th percentile in all the 10 variables. Results Below of the Chi-square analysis were presented in Table 35.

Table 35: Chi-square – Physical Activity and Nutrition Variables Section B – Frequency of Food Consumption

Variable	Healthiest option	Expected (N)	Observed (N-%)	df	p value
Physical Activity					
VPA	75 min/week	384	172(44.4%)	87	0.000
MPA	150 min/week	384	78 (20.3%)	111	0.000
Walking	180 min/week	384	125 (33%)	164	0.000
Eating Habits					
Meat/Week	1-2 times/week	384	15 (3.9%)	5.0	0.000
Fish/Week	1-2 times/week	384	11 (2.9%)	4.0	0.000
eggs/Week	1-2 times/week	384	69 (18%)	4.0	0.000
Cheese/Week	More than 4 times/week	384	91 (23.7%)	4.0	0.000
Ham,Salami,Sausags /Week	Never	384	6 (1.6%)	4.0	0.000
Legumes/Week	More than 4 times/week	384	133 (34.7%)	4.0	0.000
Sweets/Week	Never	384	33 (9.9%)	5.0	0.000
Fried Potato/Week	Never	384	3 (0.8%)	5.0	0.000
Fast Food/Week	Never	384	64 (16.7%)	3.0	0.000
Pizzeria/Week	Never	384	9 (2.3%)	3.0	0.000

6.2.6. Multiple Analysis of Variance (MANOVA)

Table 36 displayed MANOVA results used to determine the existence of statistically significant difference between sets of primary direct measures (n=5, BM, BH, BFM, SMM, and TBW) and derived indirect measures (n=7, BMI, PBFM, BFMI, PSMM, SMMI, IH, MFI) body composition variables. In the function of university major, Wilks' lambda primary variables – 0.661, F = 38.68, p = 0.000; Wilks' lambda derived variables – 0.721, F = 20.83, p = 0.000. In the function of gender: Wilks' lambda primary variables – 0.219, F = 269.52, p = 0.000, Wilks' lambda derived variables – 0.331, F = 108.36, p = 0.000. The above results are statistical evidences that body composition parameters of the samples of male and female students among the sport and non-sport majors of the Lebanese University has statistically significant differences on a general level. The Bonferroni Post Hock test determined the multiple comparisons between the four sample groups: male sport sample (MSS), Female sport sample (FSS), male non-sport sample (MNSS), and Female non-sport sample (FNSS). Significant differences were established across the four sample groups in all primary and derived body composition parameters except in:

A- Primary (original) B.C. variables:

1- BH in the sport males and non-sport male's sample groups, p= 1.00

2- BH in the sport females and non-sport females sample groups, p=1.00

3- BM in the sport females and non-sport females sample groups, p= .173

B – Derived (Index) B.C. variables:

1- BMI in the sport males and non-sport females sample groups, p= .486

2- PBFM in the non-sport males and the non-sport females sample groups, p= 1.00

3- SMM in the sport females and the non-sport females sample groups, p= 1.00

4- PSMM in the sport males and non-sport males sample groups, p= 1.00

5- PSMM in the sport females and non-sport females sample groups, p= 1.00

6- SMMI in the sport females and non-sport females sample groups, p= .898

7- IH in the sport females and non-sport females sample groups, p= .381

8- FMI in the sport females and the non-sport females sample groups, p= 1.00

Table 36: MANOVA results – general differences between analysed sets of variables (primary and derived) with respect to gender and major of respondents

	Multivariate Tests					
	Effect	*Value*	*F*	*Hypothesis df*	*Error df*	*Sig.*
Major based primary variables	Wilks' Lambda	0.661	38.68	5.0	378.0	0.000
Major Based Derived Variables	Wilks' Lambda	0.721	20.83	7.0	376.0	0.000
Gender based primary variables	Wilks' Lambda	0.219	269.52	5.0	378.0	0.000
Gender based derived variables	Wilks' Lambda	0.331	108.36	7.0	376.0	0.000

6.2.7. Multiple Regression Analysis: Predictions of Body Composition using Physical Activity and Nutrition Measures

Based on the purpose of this study in examining the relationships between the two most important factors of quality of life, such as physical activity and dietary (eating) habits, and to determine their impact on body composition, and all in relation to student specialty and gender characteristics among Lebanese universities' students, the multiple regression analysis technique using backward elimination was conducted to examine the significant impacts of physical activity and dietary habits on body composition.

In regard to physical activity, and based on the IPAQ survey structure, six physical activity variables (VPA min/day, VPA days/week, MPA min/day, MPA days/week, Walking min/day, walking days/week) were used as independent variables or predictors to examine their impact on the three main primary direct body composition measures (BM, BFM, and SMM) among the four student sample groups. The three body composition indices were tested separately by the six physical activity predictors.

Regarding examining the impact of nutrition on body composition, the independent variables of two sections of the dietary survey (Turconi et al., 2003) were used as predictors; frequency of food consumption including 10 variables, and Dietary habits including 13 variables.

Predictions that are presented below with relevant tables among the four student samples were chosen for only predictions carrying significant impact of independent variables on the dependent variable where the analysis of variance (ANOVA) determines a $p < 0.05$, R is above .5 indicating a moderate correlation between the variables, R2 is above .25 indicating that the predictor explains more than quarter of variability in the predicted variable, t values of all predictors are above 1.96, which indicates a significant impact on the dependent variable.

6.2.7.1. Sample 1 (Male Sport Sample)

In Sample one, neither Physical activity nor frequency of food consumption could predict body composition since all models including combination of variables of these two sectors extracted by multiple regression analyses using backward elimination showed that no significant impact of both independent variables on all three body composition variables BM, BFM, and SMM. The only significant impact on body composition in sample one was determined by Dietary habits variables on BFM.

A-Dietary Habits Predictors and BFM

In this category, the backward multiple regression analysis extracted 13 models to examine the impact of dietary habits on BFM. The best-fit model was model 6 including one to one and half liter of mineral water daily, beverages between meals, beverages at breakfast, two portions of fruit daily, diet content, one glass of milk or cup of yogurt daily, two portions of vegies daily, eating breakfast, $F_{(13, 86)} = 2.077$, $p < 0.05$, the $R^2 = .154$ which indicates that the model explains 15.4% of the variability in BFM. The analysis

of variance (ANOVA) showed a p value of .046 in this model which is considered significant. Table 37 shows the summary of these findings.

6.2.7.2. **Sample 2 (Female Sport Sample)**

In Sample two, physical activity variables did not carry a significant impact on body composition unlike the nutrition sections frequency of food consumption and dietary habits. The multiple regression analyses using backward elimination in this sample showed significant impacts of few models in the independent variables on all three-body composition variables BM, BFM, and SMM.

A- Frequency of Food Consumption Predictors and BM

Seven models were extracted by backward multiple regression analysis in this category to examine the impact of frequency of food consumption on body mass. All seven models carried significant impact on BM according to the analysis of variance (ANOVA) p=.000. The best-fit model was model 4 including Pizzeria/week, sweets/week, fish/week, fatty meat/week, fried potato/week, legumes/week, cheese/week, $F_{(10, 89)} = 5698$, $p < 0.05$. The $R^2 = .296$ which indicates that the model explains 29.6% of the change or variance in BM. Table 38 shows the summary of these findings.

B- Frequency of Food Consumption Predictors and BFM

In this category, backward multiple regression analysis extracted four models to examine the impact of frequency of food consumption on BFM. The best-fit model was model 3 including Pizzeria/week, eggs/week, sweets/week, fish/week, fatty meat/week, fried potato/week, fast food/week, $F_{(10, 89)} = 5.791$, $p < 0.05$, $R^2 = .337$ which indicates that the model explains 33.9% of the variance in BFM. The analysis of variance (ANOVA) showed a p=.000 in this model indicating a significant impact on the dependent variable BFM. These findings were presented in Table 39.

C- Dietary Habits Predictors and BM

In this category, the backward multiple regression analysis extracted eight models to examine the impact of dietary habits on BM. The best-fit model was model 2 including one to one half liter of mineral water daily, cake/dessert at meals, beverages between meals, breakfast content, beverages at breakfast, two portions of fruit daily, diet content, three meals daily, diet type, one glass of milk or cup of yogurt daily, two portions of vegies daily, eating breakfast, $F_{(13, 86)} = 6.013$, $p < 0.05$, the adjusted $R^2 = .453$ which indicates that the model explains 45.3% of the variability in BM. The analysis of variance (ANOVA) showed a p value of .000 in all models. Table 40 displays the summary of these findings.

D- Dietary Habits Predictors and BFM

In this category, the backward multiple regression analysis extracted eight models to examine the impact of dietary habits on BFM. The best-fit model was model 7 including one to one half liter of mineral water daily, cake/dessert at meals, beverages between meals, breakfast content, beverages at breakfast, one glass of milk or cup of yogurt $F_{(13, 86)} = 9.742$, $p < 0.05$, the $R^2 = .426$ which indicates that the model explains 42.6% of the variability in BFM. The analysis of variance (ANOVA) showed a p value of .000 in all 8 models. Table 41 shows the findings of these category analysis.

E- Dietary Habits Predictors and SMM

In this category, the backward multiple regression analysis extracted eight models to examine the impact of dietary habits on SMM. The best-fit model was model 3 including One to one half liter of mineral water daily, cake/dessert at meals, beverages between meals, breakfast content, beverages at breakfast, two portions of fruit daily, three meals daily, diet type, one glass of milk or cup of yogurt daily, two portions of vegies daily, eating breakfast, $F_{(13, 86)} = 3.876$, $p < 0.05$, the $R^2 = .326$ which indicates that the model explains 32.6% of the variability in SMM. The analysis of variance (ANOVA) showed a p value of .000 in all 9 models indicating a significant impact of this model on SMM. Table 42 shows the summary of these findings.

6.2.7.3. **Sample 3 (Male non-sport Sample)**

Just as in sample two, Physical activity variables did not carry a significant impact on body composition while both sections of nutrition: frequency of food consumption and dietary habits did. The multiple regression analyses using backward elimination in this sample showed significant impacts of few models in the independent variables on two body composition variables BM, BFM.

A- Frequency of Food Consumption Predictors and BM

Seven models were extracted by backward multiple regression analysis in this category to examine the impact of frequency of food consumption on body mass. The best-fit model was model 2 including eggs/week, sweets/week, fish/week, fatty meat/week, fried potato/week, legumes/week, meat/week, fast food/week, cheese/week, $F_{(10, 59)} = 2.220$, $p < 0.05$. The $R^2 = .250$, which indicates that the model explains 25% of the change or variance in BM. These finding were shown in Table 43.

B- Frequency of Food Consumption Predictors and BFM

Seven models were extracted by backward multiple regression analysis in this category to examine the impact of frequency of food consumption on body Fat mass. The best-fit model was model 4 eggs/week, fish/week, fatty meat/week, fried potato/week, legumes/week, meat/week, fast food/week, $F_{(10, 89)} = 2.837$, $p < 0.05$. The $R^2 = .262$ which indicates that the model explains 26.2% of the variance in BFM. The Analysis of variance (ANOVA) of model 4 showed a significant impact of this model on BFM, p=.007. Table 44 presents the above findings.

C- Dietary Habits Predictors and BFM

In this category, the backward multiple regression analysis extracted eight models to examine the impact of dietary habits on BFM. The best-fit model was model 5 including One to one half liter of mineral water daily, cake/dessert at meals, beverages between meals, breakfast content, two portions of fruit daily, diet content, snacks content, one glass of milk or cup of yogurt daily, two portions of vegies daily, $F_{(13, 56)} = 1.593$, $p < 0.05$, the $R^2 = .250$ which indicates that the model explains 25% of the variability in BFM. The analysis of variance (ANOVA) showed a p value of .033 in this model indicating a significant impact on BFM. Table 45 illustrates the summary of the findings.

6.2.7.4. **Sample 4 (Female non-sport Sample)**

In sample four, only dietary habits models showed significant impact on body composition variables BM, BFM, and SMM.

A- Dietary Habits Predictors and BM

In this category, the backward multiple regression analysis extracted 9 models to examine the impact of dietary habits on BM. The best-fit model was model 5 including cake/dessert at meals, breakfast content, beverages at breakfast, two portions of fruit daily, diet content, three meals daily, diet type, snacks content, one glass of milk or cup of yogurt daily, $F_{(13, 100)} = 4.004$, $p < 0.05$, the adjusted $R^2 = .257$ which indicates that the model explains 25.7% of the variability in BM. The analysis of variance (ANOVA) showed a p value below .05 in all models of this combination. Table 46 includes the above findings.

B- Dietary Habits Predictors and BFM

In this category, the backward multiple regression analysis extracted 9 models to examine the impact of dietary habits on BFM. The best-fit model was model 6 including cake/dessert at meals, breakfast content, diet content, three meals daily, diet type, snacks content, one glass of milk or cup of yogurt daily, two portions of vegies daily, $F_{(13, 100)} = 5.236$, $p < 0.05$, the $R^2 = .285$ which indicates that the model explains 28.5% of the variability in BFM. The analysis of variance (ANOVA) showed a p value of .000 in all 8 models indicating a significant impact of the model on BFM. Table 47 presents the above findings.

C- Dietary Habits Predictors and SMM

The best-fit model in this category was model 5 including one to one half liter of mineral water daily, cake/dessert at meals, beverages between meals, beverages at breakfast, two portions of fruit daily, diet content, diet type, snacks content, eating breakfast, $F_{(13, 100)} = 4.077$, $p < 0.05$, the $R^2 = .261$ which indicates that the model explains 26.1% of the variability in SMM. The analysis of variance (ANOVA) showed a p value of .000 in all 8 models indicating a significant impact of the model on SMM. Table 48 shows these findings in this category.

Table 37: Sample 1 prediction models established by backward regression analysis

Model	Predictors	R^2	SEE	p value
1	One to one half liter of mineral water daily, cake/dessert at meals, beverages between meals, breakfast content, beverages at breakfast, two portions of fruit daily, diet content, three meals daily, diet type, snacks content, one glass of milk or cup of yogurt daily, two portions of vegies daily, eating breakfast	.176	3.934	.168
2	One to one half liter of mineral water daily, cake/dessert at meals, beverages between meals, breakfast content, beverages at breakfast, two portions of fruit daily, diet content, three meals daily, diet type, one glass of milk or cup of yogurt daily, two portions of vegies daily, eating breakfast	.176	3.912	.121
3	One to one half liter of mineral water daily, beverages between meals, breakfast content, beverages at breakfast, two portions of fruit daily, diet content, three meals daily, diet type, one glass of milk or cup of yogurt daily, two portions of vegies daily, eating breakfast	.173	3.897	.092
4	One to one half liter of mineral water daily, beverages between meals, breakfast content, beverages at breakfast, two portions of fruit daily, diet content, diet type, one glass of milk or cup of yogurt daily, two portions of vegies daily, eating breakfast	.169	3.886	.071
5	One to one half liter of mineral water daily, beverages between meals, beverages at breakfast, two portions of fruit daily, diet content, diet type, one glass of milk or cup of yogurt daily, two portions of vegies daily, eating breakfast	.161	3.881	.059
6	One to one half liter of mineral water daily, beverages between meals, beverages at breakfast, two portions of fruit daily, diet content, one glass of milk or cup of yogurt daily, two portions of vegies daily, eating breakfast	.154	3.876	.046
7	One to one half liter of mineral water daily, beverages between meals, two portions of fruit	.145	3.875	.038

	daily, diet content, one glass of milk or cup of yogurt daily, two portions of vegies daily, eating breakfast			
8	One to one half liter of mineral water daily, beverages between meals, two portions of fruit daily, one glass of milk or cup of yogurt daily, two portions of vegies daily, eating breakfast	.130	3.889	.040
9	One to one half liter of mineral water daily, beverages between meals, one glass of milk or cup of yogurt daily, two portions of vegies daily, eating breakfast	.112	3.908	.046
10	One to one half liter of mineral water daily, beverages between meals, one glass of milk or cup of yogurt daily, eating breakfast	.100	3.913	.038
11	One to one half liter of mineral water daily, one glass of milk or cup of yogurt daily, eating breakfast	.084	3.928	.038
12	One to one half liter of mineral water daily, eating breakfast	.065	3.947	.038
13	eating breakfast	.041	3.977	.043

Table 38: Sample 2 prediction models established by backward regression analysis

Model	Predictors	R^2	SEE	p value
1	Pizzeria/week, eggs/week, sweets/week, fish/week, fatty meat/week, fried potato/week, legumes/week, meat/week, fast food/week, cheese/week	.307	6.183	.000
2	Pizzeria/week, eggs/week, sweets/week, fish/week, fatty meat/week, fried potato/week, legumes/week, meat/week, cheese/week	.307	6.149	.000
3	Pizzeria/week, eggs/week, sweets/week, fish/week, fatty meat/week, fried potato/week, legumes/week, cheese/week	.306	6.120	.000
4	Pizzeria/week, sweets/week, fish/week, fatty meat/week, fried potato/week, legumes/week, cheese/week	.302	6.101	.000
5	Pizzeria/week, sweets/week, fish/week, fried potato/week, legumes/week, cheese/week	.296	6.096	.000
6	Pizzeria/week, sweets/week, fish/week, , legumes/week, cheese/week	.278	6.140	.000
7	Pizzeria/week, sweets/week, fish/week, , legumes/week,	.263	6.173	.000

Table 39: Sample 2 prediction models established by backward regression analysis

Model	Predictors	R^2	SEE	p value
1	Pizzeria/week, eggs/week, sweets/week, fish/week, fatty meat/week, fried potato/week, legumes/week, meat/week, fast food/week, cheese/week	.351	4.031	.000
2	Pizzeria/week, eggs/week, sweets/week, fish/week, fatty meat/week, fried potato/week, meat/week, cheese/week	.351	4.009	.000
3	Pizzeria/week, eggs/week, sweets/week, fish/week, fatty meat/week, fried potato/week, fast food/week,	.337	4.029	.000
4	Pizzeria/week, eggs/week, sweets/week, fish/week, fatty meat/week, meat/week	.327	4.038	.000

Table 40: Sample 2 prediction models established by backward regression analysis

Model	Predictors	R^2	SEE	p value
1	One to one half liter of mineral water daily, cake/dessert at meals, beverages between meals, breakfast content, beverages at breakfast, two portions of fruit daily, diet content, three meals daily, diet type, snacks content, one glass of milk or cup of yogurt daily, two portions of vegies daily, eating breakfast	.453	5.585	.000
2	One to one half liter of mineral water daily, cake/dessert at meals, beverages between meals, breakfast content, beverages at breakfast, two portions of fruit daily, diet content, three meals daily, diet type, one glass of milk or cup of yogurt daily, two portions of vegies daily, eating breakfast	.453	5.553	.000
3	One to one half liter of mineral water daily, cake/dessert at meals, beverages between meals, breakfast content, beverages at breakfast, two portions of fruit daily, diet content, three meals daily, diet type, one glass of milk or cup of yogurt daily, two portions of vegies daily,	.449	5.545	.000
4	One to one half liter of mineral water daily, cake/dessert at meals, beverages between meals, breakfast content, beverages at breakfast, diet content, three meals daily, diet type, one glass of milk or cup of yogurt daily, two portions of vegies daily,	.444	5.536	.000
5	One to one half liter of mineral water daily, cake/dessert at meals, beverages between meals, breakfast content, beverages at breakfast, diet content, diet type, one glass of milk or cup of yogurt daily, two portions of vegies daily,	.438	5.539	.000
6	One to one half liter of mineral water daily, cake/dessert at meals, beverages between meals, breakfast content, beverages at breakfast, diet type, one glass of milk or cup of yogurt daily, two portions of vegies daily,	.430	5.546	.000

7	One to one half liter of mineral water daily, cake/dessert at meals, breakfast content, beverages at breakfast, diet type, one glass of milk or cup of yogurt daily, two portions of vegies daily,	.413	5.597	.000
8	One to one half liter of mineral water daily, cake/dessert at meals, breakfast content, beverages at breakfast, one glass of milk or cup of yogurt daily, two portions of vegies daily,	.396	5.648	.000

Table 41: Sample 2 prediction models established by backward regression analysis

Model	Predictors	R^2	SEE	p value
1	One to one half liter of mineral water daily, cake/dessert at meals, beverages between meals, breakfast content, beverages at breakfast, two portions of fruit daily, diet content, three meals daily, diet type, snacks content, one glass of milk or cup of yogurt daily, two portions of vegies daily, eating breakfast	.434	3.832	.000
2	One to one half liter of mineral water daily, cake/dessert at meals, beverages between meals, breakfast content, beverages at breakfast, two portions of fruit daily, three meals daily, diet type, snacks content, one glass of milk or cup of yogurt daily, two portions of vegies daily, eating breakfast	.434	3.809	.000
3	One to one half liter of mineral water daily, cake/dessert at meals, beverages between meals, breakfast content, beverages at breakfast, two portions of fruit daily, diet type, snacks content, one glass of milk or cup of yogurt daily, two portions of vegies daily, eating breakfast	.434	3.788	.000
4	One to one half liter of mineral water daily, cake/dessert at meals, beverages between meals, breakfast content, beverages at breakfast, two portions of fruit daily, diet type, one glass of milk or cup of yogurt daily, two portions of vegies daily, eating breakfast	.433	3.768	.000
5	One to one half liter of mineral water daily, cake/dessert at meals, beverages between meals, breakfast content, beverages at breakfast, diet type, one glass of milk or cup of yogurt daily, two portions of vegies daily, eating breakfast	.433	3.749	.000
6	One to one half liter of mineral water daily, cake/dessert at meals, beverages between meals, breakfast content, beverages at	.430	3.738	.000

	breakfast, diet type, one glass of milk or cup of yogurt daily, two portions of vegies daily			
7	One to one half liter of mineral water daily, cake/dessert at meals, beverages between meals, breakfast content, beverages at breakfast, one glass of milk or cup of yogurt daily, two portions of vegies daily	.426	3.730	.000
8	One to one half liter of mineral water daily, cake/dessert at meals, breakfast content, beverages at breakfast, one glass of milk or cup of yogurt daily, two portions of vegies daily	.409	3.762	.000

Table 42: Sample 2 prediction models established by backward regression analysis

Model	Predictors	R^2	SEE	p value
1	One to one half liter of mineral water daily, cake/dessert at meals, beverages between meals, breakfast content, beverages at breakfast, two portions of fruit daily, diet content, three meals daily, diet type, snacks content, one glass of milk or cup of yogurt daily, two portions of vegies daily, eating breakfast	.333	2.987	.000
2	One to one half liter of mineral water daily, cake/dessert at meals, beverages between meals, breakfast content, beverages at breakfast, two portions of fruit daily, diet content, three meals daily, diet type, one glass of milk or cup of yogurt daily, two portions of vegies daily, eating breakfast	.331	2.973	.000
3	One to one half liter of mineral water daily, cake/dessert at meals, beverages between meals, breakfast content, beverages at breakfast, two portions of fruit daily, three meals daily, diet type, one glass of milk or cup of yogurt daily, two portions of vegies daily, eating breakfast	.326	2.968	.000
4	One to one half liter of mineral water daily, cake/dessert at meals, beverages between meals, beverages at breakfast, two portions of fruit daily, three meals daily, diet type, one glass of milk or cup of yogurt daily, two portions of vegies daily, eating breakfast	.319	2.968	.000
5	One to one half liter of mineral water daily, cake/dessert at meals, beverages between meals, beverages at breakfast, two portions of fruit daily, three meals daily, diet type, one glass of milk or cup of yogurt daily, two portions of vegies daily,	.309	2.972	.000
6	One to one half liter of mineral water daily, cake/dessert at meals, beverages at breakfast, two portions of fruit daily, three meals daily, diet type, one glass of milk or cup of yogurt daily, two portions of vegies daily,	.299	2.977	.000
7	cake/dessert at meals, beverages at breakfast, two portions of fruit daily, three meals daily, diet type,	.287	2.985	.000

	one glass of milk or cup of yogurt daily, two portions of vegies daily,			
8	cake/dessert at meals, beverages at breakfast, two portions of fruit daily, three meals daily, diet type, two portions of vegies daily,	.276	2.992	.000
9	cake/dessert at meals, beverages at breakfast, two portions of fruit daily, diet type, two portions of vegies daily,	.260	3.009	.000

Table 43: Sample 3 prediction models established by backward regression analysis

Model	Predictors	R^2	SEE	p value
1	Pizzeria/week, eggs/week, sweets/week, fish/week, fatty meat/week, fried potato/week, legumes/week, meat/week, fast food/week, cheese/week	.250	15.774	.054
2	eggs/week, sweets/week, fish/week, fatty meat/week, fried potato/week, legumes/week, meat/week, fast food/week, cheese/week	.250	15.643	.033
3	eggs/week, fish/week, fatty meat/week, fried potato/week, legumes/week, meat/week, fast food/week, cheese/week	.247	15.549	.021
4	eggs/week, fish/week, fatty meat/week, fried potato/week, legumes/week, meat/week, fast food/week	.243	15.463	.012
5	eggs/week, fish/week, fried potato/week, legumes/week, meat/week, fast food/week	.233	15.437	.008
6	eggs/week, fried potato/week, legumes/week, meat/week, fast food/week	.219	15.458	.006
7	eggs/week, fried potato/week, legumes/week, meat/week	.202	15.502	.005

Table 44: Sample 3 prediction models established by backward regression analysis

Model	Predictors	R^2	SEE	p value
1	Pizzeria/week, eggs/week, sweets/week, fish/week, fatty meat/week, fried potato/week, legumes/week, meat/week, fast food/week, cheese/week	.269	9.237	.033
2	eggs/week, sweets/week, fish/week, fatty meat/week, fried potato/week, legumes/week, meat/week, fast food/week, cheese/week	.267	9.172	.020
3	eggs/week, fish/week, fatty meat/week, fried potato/week, legumes/week, meat/week, fast food/week, cheese/week	.265	9.109	.012
4	eggs/week, fish/week, fatty meat/week, fried potato/week, legumes/week, meat/week, fast food/week	.262	9.050	.007
5	eggs/week, fish/week, fried potato/week, legumes/week, meat/week, fast food/week	.252	9.042	.004
6	eggs/week, fried potato/week, legumes/week, meat/week, fast food/week	.240	9.040	.003
7	eggs/week, fried potato/week, legumes/week, meat/week	.223	9.073	.002

Table 45: Sample 3 prediction models established by backward regression analysis

Model	Predictors	R^2	SEE	p value
1	One to one half liter of mineral water daily, cake/dessert at meals, beverages between meals, breakfast content, beverages at breakfast, two portions of fruit daily, diet content, three meals daily, diet type, snacks content, one glass of milk or cup of yogurt daily, two portions of vegies daily, eating breakfast	.251	9.593	.168
2	One to one half liter of mineral water daily, cake/dessert at meals, beverages between meals, breakfast content, beverages at breakfast, two portions of fruit daily, diet content, three meals daily, diet type, snacks content, one glass of milk or cup of yogurt daily, two portions of vegies daily	.251	9.510	.120
3	One to one half liter of mineral water daily, cake/dessert at meals, beverages between meals, breakfast content, beverages at breakfast, two portions of fruit daily, diet content, three meals daily, snacks content, one glass of milk or cup of yogurt daily, two portions of vegies daily	.251	9.429	.082
4	One to one half liter of mineral water daily, cake/dessert at meals, beverages between meals, breakfast content, two portions of fruit daily, diet content, three meals daily, snacks content, one glass of milk or cup of yogurt daily, two portions of vegies daily	.251	9.351	.053
5	One to one half liter of mineral water daily, cake/dessert at meals, beverages between meals, breakfast content, two portions of fruit daily, diet content, snacks content, one glass of milk or cup of yogurt daily, two portions of vegies daily	.250	9.278	.033
6	One to one half liter of mineral water daily, cake/dessert at meals, beverages between meals, breakfast content, two portions of fruit daily, diet content, snacks content, one glass of milk or cup of yogurt daily	.248	9.210	.020
7	One to one half liter of mineral water daily, cake/dessert at meals, breakfast content, two	.244	9.163	.012

	portions of fruit daily, diet content, snacks content, one glass of milk or cup of yogurt daily			
8	One to one half liter of mineral water daily, cake/dessert at meals, breakfast content, two portions of fruit daily, diet content, one glass of milk or cup of yogurt daily	.235	9.140	.008
9	One to one half liter of mineral water daily, cake/dessert at meals, breakfast content, diet content, one glass of milk or cup of yogurt daily	.218	9.169	.006
10	One to one half liter of mineral water daily, cake/dessert at meals, breakfast content, diet content	.185	9.289	.009
11	One to one half liter of mineral water daily, cake/dessert at meals, breakfast content	.151	9.409	.012

Table 46: Sample 4 prediction models established by backward regression analysis

Model	Predictors	R^2	SEE	p value
1	One to one half liter of mineral water daily, cake/dessert at meals, beverages between meals, breakfast content, beverages at breakfast, two portions of fruit daily, diet content, three meals daily, diet type, snacks content, one glass of milk or cup of yogurt daily, two portions of vegies daily, eating breakfast	.260	9.269	.003
2	One to one half liter of mineral water daily, cake/dessert at meals, beverages between meals, breakfast content, beverages at breakfast, two portions of fruit daily, diet content, three meals daily, diet type, snacks content, one glass of milk or cup of yogurt daily, eating breakfast	.260	9.223	.001
3	cake/dessert at meals, beverages between meals, breakfast content, beverages at breakfast, two portions of fruit daily, diet content, three meals daily, diet type, snacks content, one glass of milk or cup of yogurt daily, eating breakfast	.260	9.179	.001
4	cake/dessert at meals, breakfast content, beverages at breakfast, two portions of fruit daily, diet content, three meals daily, diet type, snacks content, one glass of milk or cup of yogurt daily, eating breakfast	.259	9.141	.000
5	cake/dessert at meals, breakfast content, beverages at breakfast, two portions of fruit daily, diet content, three meals daily, diet type, snacks content, one glass of milk or cup of yogurt daily	.257	9.107	.000
6	cake/dessert at meals, breakfast content, beverages at breakfast, two portions of fruit daily, diet content, three meals daily, snacks content, one glass of milk or cup of yogurt daily	.249	9.113	.000
7	cake/dessert at meals, breakfast content, two portions of fruit daily, diet content, three meals daily, snacks content, one glass of milk or cup of yogurt daily	.241	9.121	.000

8	cake/dessert at meals, breakfast content, diet content, three meals daily, snacks content, one glass of milk or cup of yogurt daily, beverages at breakfast, one glass of milk or cup of yogurt daily, two portions of vegies daily	.229	9.149	.000
9	cake/dessert at meals, diet content, three meals daily, snacks content, one glass of milk or cup of yogurt daily, beverages at breakfast, one glass of milk or cup of yogurt daily, two portions of vegies daily	.212	9.206	.000

Table 47: Sample 4 prediction models established by backward regression analysis

Model	Predictors	R^2	SEE	p value
1	One to one half liter of mineral water daily, cake/dessert at meals, beverages between meals, breakfast content, beverages at breakfast, two portions of fruit daily, diet content, three meals daily, diet type, snacks content, one glass of milk or cup of yogurt daily, two portions of vegies daily, eating breakfast	.296	5.868	.000
2	One to one half liter of mineral water daily, cake/dessert at meals, beverages between meals, breakfast content, beverages at breakfast, two portions of fruit daily, diet content, three meals daily, diet type, snacks content, one glass of milk or cup of yogurt daily, two portions of vegies daily	.296	5.841	.000
3	cake/dessert at meals, beverages between meals, breakfast content, beverages at breakfast, two portions of fruit daily, diet content, three meals daily, diet type, snacks content, one glass of milk or cup of yogurt daily, two portions of vegies daily	.295	5.814	.000
4	cake/dessert at meals, breakfast content, beverages at breakfast, two portions of fruit daily, diet content, three meals daily, diet type, snacks content, one glass of milk or cup of yogurt daily, two portions of vegies daily	.294	5.789	.000
5	cake/dessert at meals, breakfast content, beverages at breakfast, diet content, three meals daily, diet type, snacks content, one glass of milk or cup of yogurt daily, two portions of vegies daily	.292	5.771	.000
6	cake/dessert at meals, breakfast content, diet content, three meals daily, diet type, snacks content, one glass of milk or cup of yogurt daily, two portions of vegies daily	.285	5.771	.000
7	cake/dessert at meals, breakfast content, diet content, three meals daily, diet type, snacks content, one glass of milk or cup of yogurt daily	.276	5.782	.000
8	cake/dessert at meals, breakfast content, diet content, three meals daily, snacks content, one glass of milk or cup of yogurt daily	.262	5.808	.000

9	cake/dessert at meals, diet content, three meals daily, snacks content, one glass of milk or cup of yogurt daily	.248	5.835	.000

Table 48: Sample 4 prediction models established by backward regression analysis

Model	Predictors	R^2	SEE	p value
1	One to one half liter of mineral water daily, cake/dessert at meals, beverages between meals, breakfast content, beverages at breakfast, two portions of fruit daily, diet content, three meals daily, diet type, snacks content, one glass of milk or cup of yogurt daily, two portions of vegies daily, eating breakfast	.266	3.261	.002
2	One to one half liter of mineral water daily, cake/dessert at meals, beverages between meals, breakfast content, beverages at breakfast, two portions of fruit daily, diet content, three meals daily, diet type, snacks content, one glass of milk or cup of yogurt daily, eating breakfast	.266	3.245	.001
3	One to one half liter of mineral water daily, cake/dessert at meals, beverages between meals, breakfast content, beverages at breakfast, two portions of fruit daily, diet content, three meals daily, diet type, snacks content, eating breakfast	.266	3.229	.001
4	One to one half liter of mineral water daily, cake/dessert at meals, beverages between meals, breakfast content, beverages at breakfast, two portions of fruit daily, diet content, diet type, snacks content, eating breakfast	.265	3.216	.000
5	One to one half liter of mineral water daily, cake/dessert at meals, beverages between meals, beverages at breakfast, two portions of fruit daily, diet content, diet type, snacks content, eating breakfast	.261	3.210	.000
6	cake/dessert at meals, beverages between meals, beverages at breakfast, two portions of fruit daily, diet content, diet type, snacks content, eating breakfast	.254	3.208	.000
7	cake/dessert at meals, beverages between meals, beverages at breakfast, diet content, diet type, snacks content, eating breakfast	.244	3.216	.000

8	cake/dessert at meals, beverages between meals, beverages at breakfast, diet content, diet type, snacks content	.231	3.228	.000
9	cake/dessert at meals, beverages between meals, beverages at breakfast, diet content, snacks content	.212	3.251	.000

7. DISCUSSION

This study was designed for the purpose of examining the relationships between physical activity and dietary habits, and determining their impact on body composition in relation to student specialty and gender characteristics among Lebanese universities' students.

Based on the purposes, the aims of this dissertation were to determine the physical activity, eating habits, and Body composition profiles among Lebanese universities' students; compare these profiles between students of Physical Education and Sport sciences, and students from another specialities; comparing these profiles among genders of the studied sample; establish a clear statistical analysis from the above compared samples' profiles to determine the descriptives, correlations, and differences between the variables of lifestyle factors; and finally create an optimal model of behavior towards Physical Education and Eating Habits for Lebanese students according to gender to be implemented as a strategic education policy for future. Therefore, the General Hypothesis (HG) was that eating habits and physical activity are independent factors that statistically significantly affect the quality of body composition in Lebanese University students. The supporting hypotheses were: H1) Students from Faculties of Physical Education and Sports Sciences have better dietary habits, higher levels of physical activity, and better body composition averages than students of other university specialisms; H2) Students of Physical Education and Sports Sciences meet the International standards of physical activity levels; H3) Students of other University specialisms do not meet the International standards of physical activity levels; H4 There are significant differences in the means of levels of Physical Activity and Body Composition between female students of Physical Education and Sports Sciences and other University specialisms; H5) There are significant differences in the means of levels of Physical Activity and Body Composition between male students of Physical Education and Sports Sciences of other University specialisms; H6) Physical Activity has stronger influence on Body Composition than Dietary Habits independent on gender.

For a better understanding of our study results, these results were interpreted and discussed in light of literature as they were compared and contrasted with the results of other previous studies that analyzed the same parameters in university students of other countries. The socio-demographic characteristics of the Lebanese students sample displayed a mean age of 22.1± 4.1 years. Sport specialty students represented (52%) of the whole sample (n=384) while non- sport specialty students represented (48%). The sport sample included similar numbers of males (n=100) and females (n=100), while the non-sport sample included 114 female and 70 males. This sample size difference in the non-sport sample is due to the fact that the majority (around two thirds) of registered students in the educational specialties in the Lebanese University, faculty of Education except the physical education specialty were females according to the students' affairs offices students' lists (2020-2021) in both faculty branches in Beirut. Almost half of the students were in their second academic year. Most of them (above 90%) were single and around half of them were employed. Significant differences among university specialties were only maintained in the following variables: Mother's level of education and father's level of education where the sport sample students' parents displayed a higher level of

education than their non-sport majors' peers. Professional status also showed a significant differences between both majors since most of the non-sport major students were employed while half of the sport major students were employed. This result may be due to the concern of Lebanese schools to cover the basic curriculum subjects like mathematics, social sciences, Arabic and foreign languages, social studies and other main subjects by recruiting teachers specialized in these subjects, unlike the physical education subject, which is considered a supplementary subject and large numbers of schools especially of the public sector were suffering from the lack and vacant staff in physical education (Boutros, 1988).

In Body Composition, the mean body fat mass percentage was higher in females than in males as expected, but values were within the healthy body fat percentage range stated by (InBody, 2018). Three student samples (sport males n=100, sport females n=100, non-sport females n=114) were found within the PBFM healthy ranges (10-20% males and 18-28% females) while the non-sport males sample (n=70) average was (24.3%). However, non-sport females were within the normal healthy ranges. The status of healthy body weight in female students might be attributed to the general fact which considers females more worried about their body shape and weight than males at young ages (Sheldon et al., 2010). "Thinness" body shape style is found to be more favourable in university settings as a mark of beauty based on sociocultural beliefs (Sheldon et al., 2010; Ferguson et al., 2011). Based on university specialty, the percent body fat mass (PBFM) in the Lebanese physical Education and sport male students (12%) was consistent with those percentages of the male students of the University of Belgrade, Serbia (13.01%) (Dopsaj et al., 2015), and slightly lower than the university students of Gdansk, Poland (14.28%), the university students of Muricia, Spain (14.73%) (Lopez Sanchez, 2019). However, Lebanese females showed similar PBFM results (22.2%) with the Serbian female colleagues (23.8%) in which both gender scores were within the healthy PBFM ranges. As for the non-sport sample, the Lebanese male scores of PBFM (24.3%) which was above healthy average, was consistent with the average of Abu Dhabi police officers (25.31%) represented in Kukic & Dopsaj, (2017) study, but higher than the PBFM percentage of the Korean university students (19.8%) (Park et al., 2015).

Regarding the BMI values, the third Lebanese sample group (non-sport males) was the only overweight sample scoring (27.8 kg/m^2), while all the three other samples were considered having normal BMI ranges (18.50-24.99 kg/m^2) as defined by the (National Heart, Lung, and Blood Institute, 1998; Nuttal, 2015). Males showed higher BMI values than females. However, all students' samples' BMI means were within the healthy BMI ranges except the third sample (n=70) which included (36% overweight level, and 36% obese level) compared to sample four (non-sport females) which showed only (23% overweight level, and 0% obesity level). Nevertheless, the higher prevalence of overweight/obesity among our Lebanese non-sport male students (72%) compared to that among Lebanese non-sport female students (23.0%) is consistent with other studies (National Research Council and Institute of Medicine, 2013; Mctigue et al., 1998; Drapeau et al., 2010) but is still alarming. Obesity at a younger age is a predisposing factor for adulthood obesity (National Research Council and Institute of Medicine 2013) and students who are overweight or obese at a younger age are more likely to stay obese as

they get older (National Research Council and Institute of Medicine, 2013; Strong et al., 2008).

Our study data revealed that significantly more males than females had a BMI greater than 25 kg*m^2 (46% vs. 15%). As compared to another previous Lebanese study (Yahia, et al., 2008), conducted at the Lebanese American university, males' results in our study were found alarming since the majority of the Lebanese American university students (64.7% n= 143) were of normal weight (49% male students compared to 76.8% female students). However, these results could be misleading and should be interpreted with attention since the BMI scale is not a sufficiently reliable indicator of dietary status. Overweight among young physically active students may be attributed to the result of the high percentage of muscle mass (Tarnus and Bourdon 2006; Kyle et al., 2003). Lebanese male physical education and sport sample students' BMI average (23.2 kg/m^2) was consistent with their colleagues in other countries like Serbia (24.5 kg/m^2) (Dopsaj et al., 2015), Poland (24.17 kg/m^2), and Spain (23.64 kg/m^2) (Lopez Sanchez, 2019). Regarding PBFM, the Lebanese male sport students attained better averages (12%) than the Polish (Gdansk) males (14.28 %), and the Spanish (Murcia) Students (14.73%), male university students from Madrid (Spain) (16.5%), Valencia (Spain) (18.75%) and Valparaíso (Chile) (22.7%) (Lopez Sanchez, 2019).

In Addition, the Lebanese female sport students' BMI average (20.9 kg/m^2) was similar to the Serbian university of Belgrade female BMI average (21.7 kg/m^2) (Dopsaj et al., 2015).

As expected, male students were taller and heavier than females on average in both sport and non-sport specialization categories. It can be noted that most primary and derived parameters' values were higher in male students, which contributes to higher total body mass (BM) and body height (BH) in males. According to university specialty classification, the sport specialty students had better body composition averages than non-sport specialties had. Sport males had lesser values of fat mass, index of hypokinesia, body fat mass index, but higher values of skeletal muscle mass percentage, total body water, muscle fat index, indicating better and healthier body composition status. Non-sport females were heavier as expected. Other primary and derived parameters showed similar and close values between both specializations' students. The t-test of university specialization classification for males showed significant difference between sport males and non-sport males in most body composition indices except BH, and PSMM. However, females of both specializations showed significant differences in most indices except BH, SMM, SMMI, and IH. These results indicated an obvious supremacy in healthier body composition status of the sport sample students on their non-sport sample peers. The reasons lies in the level of physical activity, since it has been shown that exercise training have one of the major influences on the linear growth and muscle mass development (Rogol et al., 2000; Tarnus & Bourdon, 2006).

In comparing descriptive results of the Lebanese students' body composition samples with samples of other countries like Serbia (Dopsaj et al., 2015), South Korea (Park et al., 2015), UAE (Kukic & Dopsaj, 2017), Poland and Spain (Lopez Sanchez et al., 2019), similar results were shown in total body water percentage (TBW) between

Lebanese and Serbian students scoring (62.8%, 63.9% respectively for sport males, and 56.8%, 55.83% respectively for sport females). The percentage of skeletal muscle mass (PSMM) ranges were satisfactory (Above 50%) in both Lebanese male student sample groups (Sport and non-sport) and were higher than the percentage of Abu Dhabi male police officers (42.2%). In Body Fat Mass Index (BFMI) presented as body fat relative to body size (BH), the Lebanese non-sport male students showed similar results with Abu Dhabi police officers with (7.1 kg/m^2 and 6.95 kg/m^2 respectively). However, Lebanese sport male students showed lesser value (2.8 kg/m^2) indicating better body composition status. Skeletal Muscle Mass Index (SMMI) presented as SMM relative to body size (BH), showed higher values in the Lebanese Sport and non-sport males (15.6 kg/m^2 for both samples) compared to Abu Dhabi police officers (11.19 kg/m^2). The Muscle Fat Index (MFI) presented as skeletal muscle mass relative to body fat mass (BFM), showed better results in Lebanese sport males (5.7 kg) compared to the Korean university students (4.6 kg). However, the Korean female students showed better result (6.9 kg) than the Lebanese sport females (2.1 kg). Finally, the scores of Index of Hypokinesia which is an index unit presented as PBFM relative to BMI, were lesser and better in Lebanese sport males (0.5) compared to Abu Dhabi police officers average (0.94).

The MANOVA test used to determine the existence of statistically significant difference between sets of primary direct measures and derived indirect measures of body composition variables among the sport and non-sport majors of the Lebanese University showed statistically significant differences on a general level.

The greatest influence on body composition represented by their correlations with physical activity parameters showed that minutes of walking per week had a low positive and negative influence on (9) body composition variables in sample two (Sport female students). In the same sample, sedentary life style represented by minutes of sitting per week showed also (low positive and negative influence on (9) body composition variables). These results were different from the results of Lopez-Sanchez et al. (2019) study, which found that the greatest influence on body composition was applied by minutes of VPA/week which carried a low positive influence in (12) body composition variables.

On the other hand, this study shared a similarity in (eating vegetables per day) variable which displayed a (low positive and negative influence on 8 BC variables) in sample two of our study, with the finding of Lopez-Sanchez et al. (2019) study on Polish and Spanish university student since the consumption of vegetables per day had a positive low influence on (14) body composition variables. The greatest influence on body composition represented by their correlations with Dietary habits variables were as follows: Diet Content influenced (11) body composition variables with a low positive and negative influence in sample four (female non-sport sample).

Regarding Physical Activity, the IPAQ continuous scores showed that the level of weekly total physical activity for the sport sample (n=200) based on domains of physical activity expressed in three energy dimensions: vigorous, moderate, walking was 6447 MET/min/week in males, and 5434 MET/min/week in females. As for the non-sport sample (n=184), these results displayed 2846 Met/min/week in males and 2413

Met/min/week in females. The total MET/min/week classification of the Lebanese university students was 4285 MET/min/week. This value of continuous physical activity level was consistent with the Bosnian students' level of Sarajevo university (4474,68 MET/min/week) mentioned in Doder et al. (2021) study , but was higher than those of Russian university students averaged 1804 and 1707 MET-min/week for male and female subsamples respectively (Loginov et al., 2021). However, the results of the non-sport student sample were consistent with the results of (Fayyad & Dopsaj, 2021) study which represented 2970.5 MET-min/week in males and 2719.5 MET-min/week in females.

The categorical physical activity levels of the entire Lebanese students sample (n=384) displayed a high level of 23.5% (n= 90), a moderate level of 30.5% (n= 117), and a low level of (46% n= 177). This alarming percentage of low physical activity level in Lebanese university students was surprisingly higher than the levels of the Indian university students (15.4%, n=40) (Padmapriya et al., 2013), the Russian Surgut state university students (33% n = 124) (Loginov et al., 2021), the Filipino University Students (15% n= 59), (Pituk et al., 2019), and the previous two Lebanese universities students (Fayyad & Dopsaj, 2021) (17 % n= 102), and (Assaf et al., 2019), (15% n= 15). All the above results, unlike our study results were in line with (Kljajevic et al., 2021) findings which demonstrated after examining in a systematic synthesis review the scientific evidence regarding physical activity and physical fitness among university students that the majority of the students' samples in all reviewed studies (n= 21) were classified with moderate levels of physical fitness and physical activity.

As it may have been expected, male students were more physically active than females and this finding is compatible with some previous which shared the same findings (Yahia et al., 2010; Haase et al., 2004; Suchomel et al., 2008; Mynarski et al., 2014; Doder et al., 2021).

In addition, the sport sample students were more active than their non-sport colleagues including the three types of PA activities (vigorous physical activity or VPA, moderate physical activity or MPA, and light physical activity or LPA including walking). This finding can be interpreted as a result of the extensive study curriculum and the requirements of their scheduled programme including high intensity practical fitness exercises which can not be accomplished without presence of high anthropometric factors that students in other university specializations lack. Therefore, the studied content of the curriculum and specificity must be taken into consideration when evaluating students' physical activity (Popoyych et al., 2016; Stepien et al., 2014).

Based on students' specialization, the Mann Whitney U Test displayed significant differences between males in most physical activity variables except in the cycling activity and time of traveling in a motor vehicle. Sport specialty male students were more active than their non-sport colleagues in all intensity types of physical education, VPA, MPA, and LPA or walking, while the non-sport students scored higher averages in sitting activities. In total, the sport specialty males achieved a combination of 205 minutes per week including 113.7 min/week of VPA, and 91.4 min/week of MPA, and with this combination, this sample group has achieved the level of physical activity recommended

by (WHO, 2006). However, the non-sport males achieved a combination of 85.2 minutes per week including 41.3 min/week of VPA, and 43.9 min/week of MPA, and with these averages, non-sport males did not reach the (WHO, 2006) recommended level of weekly physical activity. Regarding the female gender, significant differences existed also in most PA variables except in the days of traveling in the motor vehicle. Sport specialty female students showed also higher averages in all intensity types of physical education, VPA, MPA, and LPA or walking, while the non-sport females scored higher averages in traveling in motor vehicle and sitting activities. In total, the sport specialty females achieved a physical activity combination of 184.4 minutes per week including 88.8 min/week of VPA, and 95.6 min/week of MPA, and with this combination, the female sport sample has achieved the level of physical activity recommended by (WHO, 2006). However, the non-sport females which achieved a combination of 79.2 minutes per week including 29.9 min/week of VPA, and 49.3 min/week of MPA did not reach the WHO recommended level of weekly physical activity. These results were most likely owing to the nature of lifestyle of both university specializations since (89%) of the sport sample students rated their lifestyle between moderately active to very active while only (45%) of the non-sport sample rated their lifestyle within the above categories. As compared to Spanish and Polish students in the study of Lopez Sanchez, (2019), the Lebanese male sport students accomplished less weekly VPA and MPA than the Polish Gdansk students (160.12 min/week of MPA and 282.69 min/week of VPA) and the Spanish Murcia students, (318.11 min/week of MPA and 285.35 min/week of VPA). However, our findings regarding the Lebanese students' quantities of weekly minutes of MPA and VPA were higher than those of students of University of Belgrade, Serbia (males 180 min/week of MPA and VPA combination, Females 150 min/week of MPA and VPA combination). Physical, social, economic, politial environment worldwide, in addition to the genetic factors of students could be considered relevant answers to different levels of physical activity found (Pérusse et al., 1987).

Regarding Inactivity or sedentary behavior which was presented in sitting hours during weekdays and weekends, the average hours for the non-sport specialty students (6.85 hour/day) was high compared to sport specialty students (5.65 hour/day). The gender based classification in sitting activities showed similar values between males and females within both samples. Although this percentage of sedentariness was high in the Lebanese university students, it is considered better than other similar studies samples (Lachance et al., 2010; Cameron et al., 2005; Martins et al., 2021). The average time spent sitting by Lebanese students which is 6.25 hours per day was very consistent with (Fayyad & Dopsaj, 2021) result: 6.23 hours per day or (43.6 hours per week), which is in line either with the study of Loginov et al. (2015), who found that general university students spend around 50 hours per week seated and technical university students spend about 44 hours. Another study (Oyeyemi et al., 2017), which used accelerometers rather than IPAQs to assess physical activity and inactive time among students, found that university students spent an average of 458.6 minutes per day engaging sedentary activities, which equated to approximately eight hours per day and 54 hours per week. However, our Lebanese students sitting activities average was clearly higher than that of Sarajevo, Bosnia and Herzegovina university students (3.5 hours/day) (Doder et al., 2021).

In our study, Pearson correlation analysis conducted to examine the relations between body composition indices and physical activity variables showed that the sedentary life style represented by minutes of sitting per week carried a low positive influence on 6 body composition variables (BM = .270 , BMI = .357, BFM= .338, PBFM= .330, BFMI= .375, and IH = .235). This result means that the higher minutes per week of sitting activities are associated with heavier body mass, higher values of body mass index, body fat, body fat percentage, body fat mass index, and index of Hypokinesia.

The sedentariness status resulting from sitting in front of computers and long hours of class attendance, is behind the overweight status indicated by the high prevalence of fat tissues storage. On the contrary, as physical activity increases, the storage of muscle tissues increases and develops in parallel (Anderson et al., 1988). The sedentary lifestyle was found to expose people to the high risks of general cardiovascular diseases with growth of the mortality, morbidity statistics and the high incidence rates of diabetes and obesity even when the sedentary lifestyle is associated with a moderate physical activity (Matthews et al., 2019; Patterson et al., 2018). According to all mentioned facts, the focus should be placed on reducing barriers that students' experience that may impact their physical activity (Roberts et al., 2015).

The non-parametric Chi-square test which was used to determine expected and observed results in physical activity of the Lebanese students' sample has demonstrated the following results: 75 minutes per week of vigorous physical activity were accomplished by (44% n=172) of the Lebanese students while (20% n=72) of them accomplished the 150 min/week of moderate physical activity, and (33% n= 125) have accomplished the 180 min/week of walking activity. The percentage of moderate intensity physical activity of Lebanese students (20%) was lower than (Lachance et al., 2010) study which found that around half of the Canadian students (n= 1572) accomplished the 150 min/week of MPA.

As for Dietary Habits, results showed that students of both university specialties and genders have satisfactory Dietary habits. The dietary habits survey (Turconi et al., 2003) addressed to all four students' samples and included four sections (Dietary Habits, Physical Activity and Lifestyle, Dietary Beliefs, and Nutritional Knowledge) showed mean scores above averages in all sections.

In the Dietary Habits section, sport specialty students showed healthier eating habits than non-sport specialties, with significant difference between both samples (p=.000). Both male and female genders showed similar results. In Physical Activity section, mean scores showed that sport specialty students reported high physical activity profile, while the non-sport specialty students were slightly above average. The gender-based classification in this section showed that both genders were equally active. In the dietary beliefs section, students have sufficient comprehension of the meaning of a healthy diet, especially females. Finally, in the nutrition knowledge, males reported better scores. In addition, the non-sport student sample displayed higher nutritional knowledge than their sport major colleagues did.

As Compared to Yahia et al. (2016) study, which assessed the same nutrition variables in a sample of American university students studying food and nutrition

science at Central Michigan University using the same dietary habits survey, the below results showed that the American students have healthier nutrition habits, better physical activity status, better dietary beliefs, and better nutritional knowledge than the Lebanese university students. In Dietary Habits section, the Lebanese and American male students scored similar average percentages (68.8%, and 67.3%). However, American female students scored higher average percentage (71.1%) than their Lebanese peers (67.5%). In the Physical Activity section, the American male students' average percentage (76%), and the female students' average percentage (70%), were higher than the Lebanese students' males and females scores (66.7%, and 67.5% respectively). In the Dietary Beliefs section, similar average percentages were scored by American and Lebanese male students (74.7%, and 74.2% respectively). However, American female students scored higher average percentage (82%) than the Lebanese females (77.5%). The final section in the nutrition survey was the nutrition knowledge. Lebanese students scored lower averages percentages also with (60.9%) for males, and (57.3%) for females, while the American students scored (68.8%) and (63.8%) for males and females respectively.

In the sport major student samples (n=200), almost one third of the students reported frequent consumption of at least two portions of fruits per day (27% males, and 34% females) while females were healthier at consuming vegetables by 62% to 38% of males. However in the non-sport student samples (n=184), almost one quarter of non-sport students reported frequent consumption of at least two portions of fruits per day (20% males, and 19% females). Females were also healthier at consuming vegetables by 31% to 20% of males, but both genders did not reach the average in this category. Results of fruits and vegetables consumption in both sport and non-sport specializations were considered lower than the results of (Yahia et al., 2016) study, where almost half of the American students reported frequent consumption of at least two portions of fruits and vegetables per day, especially females. Similar to the Lebanese female students, American females reported more frequent intake of fruits and vegetables than males. Low consumption of vegetables and fruit have been associated with higher body mass index and therefore, obesity and weight gain (Lin & Morrison 2002; Cho et al., 2003; Tohill et al., 2004).

Results of (Yahia et al. 2016) study regarding daily breakfast intake percentages (53%) were lower than the Lebanese sport sample students (63%) but higher than the non-sport sample ones (44.5%). However, the Lebanese and American university students' percentages scores regarding daily breakfast intake were lower than their Canadian university colleagues (89.3%) in the study of Lachance et al., (2010). Eating breakfast helps to lower dietary fat intake and minimize impulsive snacking (Schlundt et al., 1992; Yahia et al., 2008).

Regular three meals per day consumption was reported by around half of the sport sample students (51% males, and 59% females), and one third of the non-sport sample students (37% of both genders). Lebanese sport students' results regarding this variable were higher than the American students' results (43% of males and 38% of females), but the non-sports sample showed similar results with them.

In Daily water consumption of at least 1–1.5 L, males in both categories had healthier dietary habits from females with clear significant differences. For instance, in the sport sample, females showed (66%) and males showed (81%) with a gender significant difference (p= .019), while in the non-sport sample, females showed (46%) and males showed (67%) with a gender significant difference (.001). In comparison to (Yahia et al., 2016) results regarding this dietary habits variable, same gender significant difference in the daily water consumption was established as more males, than females, reported daily water consumption of at least 1–1.5 L (p=.001).

Almost half of the students of Central Michigan University reported consuming one to two glasses of milk per day. However, this regular daily intake of milk consumption was reported by almost one third of the Lebanese university students. It has been suggested that calcium in dairy foods may help prevent excess weight gain, especially when consumed in adequate amounts (three or more servings per day) and combined with energy balance (Poddar et al., 2009).

In the Physical Activity and Lifestyle section, outcomes of this section indicated that the Lebanese students of sport specialty reported a high physically active lifestyle, while the non-sport specialty students were slightly above average with a clear significant difference between both specialties. In addition, the gender-based classification in this section showed that both genders were equally active. In the specialty-based classification, most sport specialty students (79%) reported practicing physical activity during the entire year, and (64%) of them reported practicing more than 4h per week. Around half of them rated their lifestyle from moderately active (40.5%) to very active (48.5%). However in non-sport sample (n=184), 11% reported practicing physical activity during the entire year and only (7%) of them reported practicing more than 4h per week. (38.5% and 6.5%) of the non-sport students rated their lifestyle between moderately active to very active respectively.

Regarding the gender based classification; most male students (79%) and almost all female students (99%) reported practicing physical activity during the entire year, 78% of males and (62%) of females reported practicing more than 4h per week. Around one third of male students (28% and 34%) rated their lifestyle from moderately active to very active respectively, while (49% and 24%) of female students rated their lifestyle from moderately active to very active respectively. As compared to the American students of Central Michigan University, half of American students reported being physically active but only about one-third of the students (33%) reported exercising more than 4h per week. Males were more active than females.

In the Dietary Beliefs section, results indicated that students have sufficient comprehension of the meaning of a healthy diet, especially females. Sport students showed more nutrition awareness than non-sport students did, although no significant difference was determined. Almost two thirds of students in both specialties chose the correct answer (a diet rich in different foods) when they were asked about the healthiest diet. Around half of sport major students and on third of non-sport major students chose the correct answer (drinking two glasses of milk/eating two cups of yogurt every day) when they were asked about the healthiest eating behavior. Regarding the cooking

method, around two thirds of sport students and one third of non-sport students chose grilling/boiling as the healthiest option. These results are in line with other studies (Turconi et al., 2008; Croll et al., 2001) and suggest that students' comprehension of the meaning of healthy and unhealthy diet does conform to dietary guidelines (Dietary Guidelines Advisory Committee, 2010).

In the final section of (Turconi et al., 2003) nutritional survey, Nutritional Knowledge, results showed that the Lebanese students have satisfactory knowledge about nutrition. However, male students reported better nutritional knowledge than females with significant difference on questions related to foods rich in dietary fibers, foods low in fat, foods rich in protein, different food substances containing energy, functions of vitamins and minerals, and on questions related to the "definition" of daily energy expenditure. This gender based results on nutrition knowledge section contrasts the results of (Yahia et al., 2016; Von Bothmer & Fridlund, 2005) who found that female students had a higher nutritional knowledge score than male students. Females, in general, are more likely than males to be interested in nutrition, weight control, and to make positive changes (Von Bothmer & Fridlund, 2005; Livingston et al., 2012).

Based on specialty classification, non-sport student attained higher nutritional knowledge scores than their sport colleagues.

The non-parametric Chi-square test used to determine expected and observed results in healthy eating habits of the Lebanese students' sample has demonstrated the following general result: the healthiest eating habits determined in "Krause's food, nutrition, and diet therapy textbook" authored by Kathleen, Mahan, and Stump (2004), were reported by less than one third of the Lebanese students' sample (n=384). These results were found poor when compared to other relevant American and Canadian previous studies assessing similar nutrition variables (Yahia et al., 2016; Lachance et al., 2010). Yahia et al. (2016) study found for instance that fast food consumption was prohibited by 33% of Central Michigan university students. However, only 16.7% of Lebanese university students were skipping fast food consumption. Previous studies have indicated that consumption of fast food was associated with weight gain and obesity (Malik et al., 2006; Bachman et al., 2006). Only (3.9% n= 15) of Lebanese students were consuming meat 1-2 times per week in comparison to Central Michigan university students (26%, n= 62). 2.9 % (n=11) of Lebanese students were consuming fish 1-2 times per week compared to (53% n=126) of American students, and Canadian students (72%, n= 2262), (18%, n=43) of the Lebanese students were consuming eggs 1-2 times per week compared to (69%, n= 164) of American students. (23.7%, n=91) Lebanese students were consuming cheese more than 4 times per week in comparison to their American university peers (65%, n= 154). Consumption of legumes for more than 4 times per week which was considered the best eating habits among frequency of food consumption section included the only dietary habit that showed Lebanese students supremacy on their American peers since it was reported by (34.7%, n=133) of the Lebanese sample and (22%, n=52) of the American students of Michigan university. Prevention of weekly consumption of sweets, fried potato, pizzeria and ready-to-eat meat (Ham/salami/sausages), were reported by (9.9%, 0.8%, 2.3%, and 1.6% of the Lebanese

students' samples respectively), and (11%, 50%, 0%, and 46% respectively) by the American students.

In examining the significant impacts of physical activity and dietary habits on body composition, the multiple regression analysis technique using backward elimination conducted on the four students' sample groups showed that only the dietary habits as a lifestyle factor have mild to moderate impact on body composition specifically on its three tested dependent variables BM, BFM, and SMM. In sample one, (sport specialty males), the only significant mild impact on body composition was determined by Dietary habits variables on BFM (R^2= .154, p value = .046).

The regression analysis conducted on sample two, (sport specialty females), revealed that the Frequency of Food Consumption Predictors determined a mild significant impact on BM (R^2 = .296, p value = .000). Also in sample two, the Frequency of Food Consumption predictors determined a low significant impact on BFM (R^2 = .337, p value = .000). In the same sample, Dietary Habits predictors showed also a moderate significant impact on BFM (R^2 = .426, p value = .000). SMM of sample two were slightly significantly impacted also by Dietary Habits (R^2 = .326, p value = .000).

In Sample three, (Non-sport males), Frequency of Food Consumption Predictors showed a low significant impact on BM (R^2 = .250, p value = .033). Frequency of Food Consumption Predictors also affected slightly and significantly the BFM of sample three (R^2 = .262, p value = .007). BFM was also slightly and significantly impacted by Dietary Habits Predictors (R^2 = .25, p value = .033).

In Sample four, (Non-sport females), only dietary habits models showed a mild significant impact on body composition variables BM (R^2 = .257 – p value = .000), BFM (R^2 = .285, p value = .000), and SMM (R^2 = .261, p value= .000).

Our study results determined by the multiple regression analysis used for the purpose of examining the significant impacts of physical activity and dietary habits on body composition shared partial similarity with (Kukic & Dopsaj, 2017) study that defined the factors that influence the structure of the body composition in Abu Dhabi police workforce using the factorial analysis of variance. The authors founded that three independent factors influence body composition: Factor 1 – Physical Inactivity and Nutrition, Factor 2 – Physical Inactivity and Exercise, and Factor 3 – Sedentary Lifestyle. Our findings were consistent with the first factor of this study analysis, which considers that nutrition has a significant impact on body composition. In other words, it has been known that body composition is the result of various factors such as diet, stress, the amount of physical activity and other factors that are parts of daily habits (Kukic & Dopsaj, 2017).

In light of the current findings of the study, the following recommendations and suggestions should be taken into consideration:

- The significant differences in variables of lifestyle factors and health measures, as well as the similarities in these variables among specialties, and genders of the Lebanese University students call for the development of targeted health-

promotion programs. These findings support the need to develop and evaluate health-promotion and obesity-prevention programs for university communities.

- Lebanese students must benefit from campuses' physical fitness centers, students' athletic and recreation clubs, and regular campus extracurricular activities to promote physical activity, reduce the time spent in sedentary activities, especially among non-sport university specialties and female gender.

- Lebanese students might benefit from a nutrition education programme offered by faculties of health sciences or student health clubs at campuses to focus on translating theoretical nutritional knowledge into daily-life applications, and being more developing gender-specific programmes for promoting healthy lifestyle behaviors. Moreover, intervention programs should also consider dieting behaviors to assess their impact on other lifestyle factors and health measures.

- Lebanese university students must benefit from the university athletic scholarships granted by most university administrations through joining the university athletic teams and clubs participating in Lebanon's collegiate athletic championships and therefore, improving the level of physical activity and general health status.

- There is necessity of inclusion of regular (annual or semi-annual) standardized measures for Physical Activity and body composition to continuously promoting the sports at each University in Lebanon and monitoring students with the aim of raising their health status to a higher level according to international health standards.

- Establishing, supporting and developing student offices, councils, and associations in universities, which are concerned in organizing physical and health activities including athletic competitions especially in colleges that teach non-sports majors in Lebanese universities.

- Modifying the Lebanese physical Education curricula towards increasing the practical based subjects is a must to promote an active lifestyle and decrease In order to avoid future risk of diseases such as obesity or diabetes.

- Educational, Health, and Athletic authorities in Lebanon especially the Lebanese University Sport Federation must include besides organizing annual university sport competitions, regular Health promotion awareness seminars, webinars, workshops, and symposiums at university campuses.

- The Lebanese Education governing bodies must allocate adequate resources for physical activity instruction and programmes, including budgets, facilities and teachers who are specialists in physical education and health education.

- Further studies in Lebanon should study lifestyle behaviors of larger samples engaging more universities from different Lebanese regions, socio-economic

backgrounds, academic specialties, and higher ages including Master and Ph.D. Lebanese students.

- Future research on Lebanese college students' lifestyles and physical activity should, however, include more objective measurement methods than self-reported questionnaires, such as personal interviews, physiological markers, calorimetry and motion sensors to ensure comprehensive and focused research needed to better understand the causes and effects of these relatively new and concerning sedentary behavior consequences.

After exploring in depth the physical activity profile, nutrition habits, and body composition status of the Lebanese university students of both genders, the implications of this study contributed to the literature of this area of science through the following outcomes; The first outcome is that this study created a unique actual model including baseline data of body composition, physical activity and eating habits for Lebanese Universities' students of both genders, which can be used in the future for screening, explaining, understanding, and assessing the lifestyle variables of university students. Another outcome is represented by developing specific recommendations on health promotion to provide to students when transitioning to university. By applying these recommendations and lifestyle guidelines, tailored interventions and programs could be developed aiming at improving youth students' wellness and lifestyle behavior and may help researchers develop appropriate health promotion strategies tailored to students' needs to foster healthy eating habits, physical activity profiles, and positive lifestyle changes among students and create a healthy campus community. The novelty of this study was demonstrated in the scarce of Lebanese studies that explored and discussed the relations and differences of the above three-lifestyle sectors using a high number of variables.

However, on the other hand, there were few limitations in our research. To begin with, the studied sample was representing only one faculty from one Lebanese university "The Lebanese University, Faculty of Education" out of around 40 national private and public universities in Lebanon. Secondly, the number of students in both gender categories of the non-sport sample was not equal, which could have influenced the results subjectively. This could, however, be attributable to the quantity of students in each field of study. Moreover, the study's cross-sectional methodology makes it difficult to determine if the observed relationships are causal. Furthermore, the students self-reported their physical activity and dietary habits behavior, which could lead to bias or underestimating of results by the respondent. However, the body composition assessments were collected using a scientific method achieving validated tests used to evaluate body composition.

8. CONCLUSION

Based on the obtained results, we can conclude the following: the body composition measurements of the Lebanese University students found supremacy and domination for male students over female students and for sport sample over the non-sport sample. Sport specialty students had better body composition averages than non-sport specialties had. Sport males had better body composition status than non-sport males with significant differences in 10 variables. Sport females also showed better body composition status than non-sport females with significant differences in 8 variables. Non-sport male students' sample were found overweight while other student samples were found within the healthy normal weight average.

Regarding the physical Activity factor, the same supremacy and domination of the sport sample students as university specialty classification and male students as gender classification still exists. As for the IPAQ survey variables, the Mann Whitney U Test showed that sport males were more active than their non-sport peers were and displayed significant differences in most IPAQ domains physical activity variables except in the cycling activity and time of traveling in a motor vehicle. Regarding the female gender, sport female were more active with significant differences existed also in most PA variables except in the days of traveling in the motor vehicle.

Although the (WHO, 2006) recommended weekly level of physical activity (at least 150 minutes of moderate-intensity aerobic physical activity per week, or 75 minutes of vigorous-intensity aerobic physical activity per week, or an equivalent combination of moderate and vigorous-intensity physical activity per week), was met by the sport sample male and female student samples unlike the non-sport male and female sample students, the Chi-square test which was used to determine the expected and observed results in physical activity showed that the average of 75 minutes per week of vigorous physical activity were accomplished by (44%, n=172) of the Lebanese students while (20%, n=72) of them accomplished the average of 150 min/week of moderate physical activity. Therefore, the observed physical activity level was surprisingly lower than that expected. On the other hand, the Lebanese university students showed a satisfactory level of continuous physical activity scores (4285 MET/min/week) since the sport sample students' results were 6447 MET/min/week in males, and 5434 MET/min/week in females, and the results of the non-sport sample were 2846 Met/min/week in males and 2413 Met/min/week in females. However, the physical activity categorical score of those Lebanese students was alarming since around half of Lebanese students were classified with a low level of (46%, n= 177), while 23.5% (n= 90) showed high level, and 30.5% (n= 117) showed a moderate level.

Although the percentage of sedentariness or sitting hours per day was high in the Lebanese University students (6.25 hours/day), it was considered consistent and even better than some international similar studies samples.

As for Eating Habits, although all Lebanese students' samples showed satisfactory results and scored above average in the four sections of (Turconi et al., 2003) nutrition survey, the physical education and sport specialty students showed healthier dietary

habits, higher physical activity rated level, more comprehensiveness in dietary beliefs, but lower level of nutritional knowledge than their non-sport peers. Regarding gender-based classification, males showed better scores in sections of dietary habits and nutrition knowledge, while females showed better scores in physical activity rated level, and nutrition beliefs. The non-parametric Chi-square test used to determine expected and observed results in healthy eating habits of the Lebanese students' sample has found that the healthiest eating habits were reported by less than one third of the Lebanese students' sample (n=384). These results were found poor when compared to other relevant international previous studies assessing similar nutrition variables.

Finally, the multiple regression analysis technique used for examining the significant impacts of physical activity and dietary habits on body composition and conducted on the four students' sample groups showed that only the dietary habits factor have mild to moderate impact on body composition specifically on its three tested dependent variables BM, BFM, and SMM. The highest significant impact on body composition was determined by dietary habits predictor variables in sample two (female sport students) showing a moderate significant impact on body fat mass (BFM). The Backward elimination has determined the best-fit model which was model (7) including the following dietary habits variables: one to one half liter of mineral water daily, cake/dessert at meals, beverages between meals, breakfast content, beverages at breakfast, one glass of milk or cup of yogurt $F_{(13, 86)} = 9.742$, $p < 0.05$, the $R^2 = .426$ which indicates that the model explains 42.6% of the variability in (BFM). The analysis of variance (ANOVA) showed a p value of .000 in this model. However, the Pearson correlation analysis conducted to determine the relations between body composition, physical activity, and dietary habits variables showed that the greatest influence on body composition represented by their correlations with physical activity parameters was determined by minutes of walking per week which had a low positive and negative influence on (9) body composition variables in sample two (Sport female students). In the same sample, sedentary life style represented by minutes of sitting per week showed also (low positive and negative influence on (9) body composition variables).As for the relation between body composition indices and dietary habits, the greatest influence of dietary habit on body composition was shown in sample four (female non-sport students) where 11 body composition variables carried positive and negative influence by diet content.

In a first step, the research hypotheses were tested statistically through the analysis of Pearson's correlation to examine the associations between the Body composition indices and physical activity variables, as well as body composition and dietary habits variables of Lebanese university students to find if the body composition indices share a significant amount of variance with physical activity and dietary habits of Lebanese students. In the second step, the regression coefficient of determination to predict possible body composition parameters from physical activity and dietary habits. Results of the above two steps were as follows: General hypothesis: Hg – Eating habits and physical activity are independent factors that statistically significantly affect the quality of body composition in Lebanese university students. It can be concluded that Hg was partially true or partially accepted.

Starting with Pearson correlation analysis of body composition and physical activity, low positive and negative impact of one physical activity and physical inactivity variables on body composition indices were established in:

1) Minutes of walking per week on (9) body composition variables in sample two (female sport students).

2) Sedentary life style represented by minutes of sitting per week on (9) body composition variables in sample two (female sport students).

Regarding Pearson correlation analysis of body composition and dietary habits, also low positive and negative impact of six dietary habits variables on body composition indices were established in:

1) Consuming pizzeria per week on (6) body composition variables in sample 1 (sport male students).

2) Consuming sweets per week on (9) body composition variables in sample 2 (female sport students) and (low positive and negative influence on (7) body composition variables in sample 4, (Female non-sport students);

3) Consuming meat per week on (8) body composition variables in sample 3 (non-sport male students);

4) Beverages at breakfast on (9) body composition variables in sample 2 (females sport students);

5) Eating vegetables per day on (8) body composition variables in the same sample.

6) Diet content on (11) body composition variables in sample 4 (female non-sport students).

Based on the above results, we can conclude that only one physical activity variable (Minutes of walking per week) has a non-significant low positive and negative affect on 9 body composition indices only in sport female sample. Physical inactivity or sedentary life style behavior represented by minutes of sitting per week carried also a non-significant low positive and negative affect on 9 body composition indices only in sport female sample. In addition, we can also conclude that the six above mentioned dietary habits variables has a non-significant low positive and negative affect on most body composition indices among all Lebanese student samples.

To summarize, the Pearson correlation analysis did not find significant (moderate to high) correlations between the body composition and the two life style factors (Physical activity and Dietary habits) of the Lebanese students and therefore, the general hypothesis was not supported through Pearson correlation analysis testing.

However, the multiple regression analysis test has given partial support to the general hypothesis. Starting by the testing the impact of physical activity on body composition, and based on the IPAQ survey structure, six physical activity variables

(VPA min/day, VPA days/week, MPA min/day, MPA days/week, Walking min/day, Walking days/week) were used as independent variables or predictors to examine their impact on the three primary direct body composition measures (BM, BFM, and SMM) among the four student sample groups. The three body composition indices were tested separately by the six physical activity predictors.

Predictions that are presented below for the four student samples were chosen for only predictions carrying significant impact of independent variables on the dependent variable where the analysis of variance (ANOVA) determines a $p < 0.05$, R is above .5 indicating a moderate correlation between the variables, R^2 is above .25 indicating that the predictor explains more than quarter of variability in the predicted variable, t values of all predictors are above 1.96, which indicates a significant impact on the dependent variable. These can be considered as prediction criteria.

In all Lebanese students' samples, the six independent physical activity predictors did not meet the above prediction body composition criteria since the multiple regression analyses using backward elimination showed that no significant impact of predictors on all three body composition variables BM, BFM, and SMM.

Regarding examining the impact of eating habits on body composition, the independent variables of two sections of the dietary survey (Turconi et al., 2003) were used as predictors; frequency of food consumption including 10 variables, and Dietary habits including 13 variables.

Dietary habits predictors have shown the following results:

1) In sample one (sport male students), the only significant impact on body composition was determined by Dietary habits variables on BFM.

2) In sample two (sport female students), the multiple regression analyses showed significant impacts of (Frequency of Food Consumption Predictors and BM, Frequency of Food Consumption Predictors and BFM, Dietary Habits Predictors and BM, Dietary Habits Predictors and BFM, Dietary Habits Predictors and SMM)

3) In sample three (non-sport male students), the multiple regression analyses showed significant impacts of (Frequency of Food Consumption Predictors and BM, Frequency of Food Consumption Predictors and BFM, Dietary Habits Predictors and BFM)

4) In sample four (non-sport female students), the multiple regression analyses showed significant impacts of (Dietary Habits Predictors and BM, Dietary Habits Predictors and BFM, Dietary Habits Predictors and SMM)

To summarize, and based on the above results, the independent variables or predictors of two sections of the eating habits dietary survey (Turconi et al., 2003) frequency of food consumption including 10 variables, and Dietary habits including 13 variables, carried low to moderate significant impact on body composition main indices (BM, BFM, and SMM). However, the six physical activity predictors did not share the

same significant impact on body composition. Therefore, we can definitely consider that the general research hypothesis HG - Eating habits and physical activity are independent factors that statistically significantly affect the quality of body composition in Lebanese university students **was partially true or Hg was partially accepted.**

By testing the general hypothesis of our research, and based on the above results of this study, we conclude that the supporting hypotheses were accepted or rejected as follows:

H_1 – Students from Faculties of Physical Education and Sports Sciences have better dietary habits, higher levels of physical Activity, and better body composition than students of other university specialisms. **H1 is true or accepted.**

H_2 – Students of Physical Education and Sports Sciences meet the International standards of physical activity levels. **H2 is true or accepted.**

H_3 – Students of other University specialisms do not meet the International standards of physical activity levels. **H3 is true or accepted.**

H_4 – There are significant differences in the means of levels of Physical Activity and Body Composition between female students of Physical Education and Sports Sciences and other University specialisms. **H4 is true or accepted.**

H_5– There are significant differences in the means of levels of Physical Activity and Body Composition between male students of Physical Education and Sports Sciences and other University specialisms. **H5 is true and accepted.**

H6: Physical Activity has stronger influence on Body Composition than Dietary Habits independent on gender. **H6 is Rejected.**

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10. APPENDICES

10.1. Appendix 1: Copy of the Ethical Approval Given by Faculty of Sport and Physical Education, University of Belgrade

CERTIFIED TRANSLATION FROM SERBIAN INTO ENGLISH

Stamp: Republic of Serbia, University of Belgrade
Faculty of Sport and Physical Education
02 no. 484-2
24 February 2011
Belgrade, Blagoja Parovica 156

UNIVERSITY OF BELGRADE
FACULTY OF SPORT AND PHYSICAL EDUCATION

APPROVAL OF THE ETHICS COMMITTEE OF THE FACULTY OF SPORT AND PHYSICAL EDUCATION, UNIVERSITY OF BELGRADE FOR EXECUTION OF THE PROJECT "EFFECTS OF THE APPLIED PHYSICAL ACTIVITY ON LOCOMOTOR, METABOLIC, PSYCHO-SOCIAL AND EDUCATIONAL STATUS OF THE POPULATION OF THE REPUBLIC OF SERBIA" (No. 47015)

Based on the inspection of the plan of the project "Effects of the Applied Physical Activity to Locomotor, Metabolic, Psycho-Social and Educational Status of the Population of the Republic of Serbia" (No. 47015, project leader assistant prof. Milivoj Dopsaj, PhD), approved by the Ministry of Science and technological development of the Republic of Serbia within the cycle of national scientific projects for the period from 2011 to 2019, the Ethics Committee of the Faculty of Sport and Physical Education of the University of Belgrade considers that both in research conception and execution planning as well as in the application of the obtained results, from its beginning the project has been undertaken based on the principles which comply with ethical standards, ensuring thus protection for human subjects from possible violation of their psycho-social and physical benefit.

In conformity with the aforesaid opinion, the Ethics Committee of the Faculty of Sport and Physical Education of the University of Belgrade has granted the approval for realization of the research planned by the project "Effects of the Applied Physical Activity to Locomotor, Metabolic, Psycho-Social and Educational Status of the Population of the Republic of Serbia" (No. 47015, project leader Assistant prof. Milivoj Dopsaj, PhD) which is approved by the Ministry of Science and technological development of the Republic of Serbia within the cycle of national scientific projects for the period from 2011 to 2019.

For the Ethics Committee
full prof. Dusan Ugarkovic, signed
associate prof. Vladimir Koprivica, signed
(Stamp)

END OF TRANSLATION

№ 178/11

I CERTIFY THAT this document which has been given to me in Serbian language, has been correctly translated into English.

IN WITNESS WHEREOF I have hereunto set my hand and seal, this 1st day of March 2011 in Beograd.

My appointment is permanent.

Gordana Vekarić, Sworn to Court
Interpreter for English and Italian language
Milutina Milankovića 130/33, Beograd, Serbia
tel:++381 11 711 03 38
e-mail:gocav@eunet.rs

Appointed by the Decision of the Republic Minister of Justice,
Belgrade, Serbia № 74-02-46/91-03

10.2. Appendix 2: Published Paper 1

International Journal of Kinesiology & Sports Science
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Level of Physical Activity at Lebanese Universities' Students of Both Genders: A Comparative Study

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ABSTRACT

Background: Examining students' levels of physical activity is important because these students will be the future leaders of their communities. **Objectives**: The aim of this study was to generate primary information and describe the lifestyle behavior patterns considering physical activity prevalence among gender-related Lebanese college students. **Methods**: The study involved 600 students (346 Men, 254 Women with mean age 23.5 ± 3.96). The participants' levels of physical activity was examined by utilizing the International Physical Activity Questionnaire (IPAQ). The over-all level of physical activity including the four-lifestyle fields: work, transportation, home and gardening, and leisure-time, was presented as metabolic equivalent-min per week (MET-min/week). **Results**: Findings indicated 22% of students with high physical activity level, 61% and 17 % with moderate and low levels respectively. Based on activity Intensity, 47% (n= 282) of students were engaged in vigorous activity, while 45.2% (n= 271) were engaged in moderate activity, and 68.3% (n=410) were engaged in walking activities. Average time spent sitting for the whole sample was 6.23 daily hours. The level of weekly total physical activity expressed in metabolic equivalent represented 2970.5 MET/min/week in males and 2719.5 MET/min/week in females. **Conclusion:** In general, Lebanese universities students were equally active, with trivial supremacy for males. Lebanese university students met the (WHO) recommendations for physical activity (>150 min/week of moderate activity or > 75 min/week of vigorous activity or an equivalent combination of both activities). Physical Activity must be developed by the provision of physical activity classes in the university curriculum and extracurricular activities.

Key words: Physical Activity, University Students, Gender, Metabolic Equivalent, Energy Expenditure

10.3. Appendix 3: Published Paper 2

The current issue and full text archive of this journal is available on Emerald Insight at:
https://www.emerald.com/insight/1363-951X.htm

Factorial analysis of stress factors among the sample of Lebanese police officers

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Received 30 May 2020
Revised 13 November 2020
Accepted 11 December 2020

Abstract

Purpose – The purpose of the study is to determine the prevalence of stress and to identify the occupational stressors among Lebanese police officers.

Design/methodology/approach – Operational Police Stress Questionnaire (PSQ-op) was addressed to 100 randomly selected male Lebanese Police officers. Twenty items from the PSQ-op were run through the principal component analysis to determine the most significant factors of stress and loading within each of the factors.

Findings – The results indicated that 59% of officers reported moderate stress level and 41% reported strenuous stress. Principal component analysis identified six independent factors or stress among Lebanese police officers explaining in total 72.1% of the total variance: excessive workload (30.6%), social-life time management (12.8%), occupational fitness (9.1%), success-related stress (8.6%), physical and psychological health (5.8%), and working alone at night (5.2%).

Research limitations/implications – This research approach encountered some limitations so further research must: use a larger sample size, include female gender and identify other sources of stressors mainly organizational or job context stressors.

Originality/value – Addressing and understanding stress factors among Lebanese police officers helps improving awareness and developing individualized treatment strategies leading police officers to engage in stress-management training to learn coping strategies and use effective tools for preventing stress before it becomes chronic.

Keywords Operational stress, Law enforcement, Police, Stress assessment, Health management
Paper type Research paper

10.4. Appendix 4: Physical Activity Compendium

TABLE 2. New codes in Version 2 of the Compendium of Physical Activities.

Major Heading	Code Number	METs	Example
Bicycling	01015	8.0	Bicycling, general
Conditioning Exercises	02101	2.5	Mild stretching
Dancing	03016	8.5	Aerobic, step, with 6–8 inch step
	03017	10.0	Aerobic, step, with 10–12 inch step
	03031	4.5	Disco, folk, square, line dancing, Irish step dancing, polka, contra, and country dancing.
	03050	5.5	Anishinaabe Jingle Dancing or other traditional American Indian dancing
Home Activities	05021	3.5	Mopping
	05025	2.5	Multiple household tasks all at once, light effort
	05026	3.5	Multiple household tasks all at once, moderate effort
	05027	4.0	Multiple household tasks all at once, vigorous effort
	05043	3.5	Vacuuming
	05045	6.0	Butchering animals
	05053	2.5	Feeding animals
	05148	2.5	Watering plants
	05149	2.5	Building a fire inside
	05181	3.0	Carrying small children
	05187	4.0	Elder care, disabled adults, only active periods
	05188	1.5	Reclining with baby
	05190	2.5	Sitting, playing with animals, light, only active periods
	05191	2.8	Standing, playing with animals, light, only active periods
	05192	2.8	Walk/run, playing with animals, light, only active periods
	05193	4.0	Walk/run, playing with animals, moderate, only active periods
	05194	5.0	Walk/run, playing with animals, vigorous, only active periods
	05195	3.5	Standing–bathing dog
Lawn and Garden	06165	4.5	Painting (Taylor Code 630)
Inactivity	07011	1.0	Lying quietly, done nothing, lying in bed awake, listening to music (not talking or reading)
	07021	1.0	Sitting quietly, sitting smoking, listening to music (not talking or reading), watching a movie in a theater
Lawn and Garden	08125	4.5	Mowing lawn, power mower (Taylor Code 590)
	08165	4.0	Raking lawn (Taylor Code 600)
	04246	3.0	Picking fruit off trees, picking fruits/vegetables, moderate effort
Miscellaneous	09071	2.0	Standing–miscellaneous
	09075	1.5	Sitting—arts and crafts, light effort
	09080	2.0	Sitting—arts and crafts, moderate effort
	09085	1.8	Standing—arts and crafts, light effort
	09090	3.0	Standing—arts and crafts, moderate effort
	09095	3.5	Standing—arts and crafts, vigorous effort
	09100	1.5	Retreat/family reunion activities involving sitting, relaxing, talking, eating
	09105	2.0	Touring/traveling/vacation involving walking and riding
	09110	2.5	Camping involving standing, walking, sitting, light-to-moderate effort
	09115	1.5	Sitting at a sporting event, spectator

Occupation	11015	2.5	Bakery, light effort
	11121	3.0	Custodial, buffing the floor with an electric buffer
	11122	2.5	Custodial, cleaning sink and toilet, light effort
	11123	2.5	Custodial, dusting, light effort
	11124	4.0	Custodial, feathering arena floor, moderate effort
	11125	3.5	Custodial, general cleaning, moderate effort
	11126	3.5	Custodial, mopping, moderate effort
	11127	3.0	Custodial, take out trash, moderate effort
	11128	2.5	Custodial, vacuuming, light effort
	11129	3.0	Custodial, vacuuming, moderate effort
	11151	4.0	Farming, chasing cattle or other livestock on horseback, moderate effort
	11152	2.0	Farming, chasing cattle or other livestock, driving, light effort
	11191	6.0	Farming, taking care of animals (grooming, brushing, shearing sheep, assisting with birthing, medical care, branding)
	11495	12.0	Skin diving or SCUBA diving as a frogman (Navy Seal)
	11615	4.0	Lifting items continuously, 10–20 lbs, with limited walking or resting
	11765	3.5	Tailoring, weaving
	11796	3.0	Walking, gathering things at work, ready to leave
	11805	4.0	Walking, pushing a wheelchair
Running	12027	4.5	Jogging on a mini-trampoline
Self Care	13036	1.0	Taking medication, sitting or standing
	13045	2.5	Hairstyling
	13046	1.0	Having hair or nails done by someone else, sitting
Sports	15265	4.5	Golf, walking and carrying clubs
	15285	4.3	Golf, walking and pulling clubs
	15591	12.5	Roller blading (in-line skating)
	15685	5.0	Tennis, doubles play
	15711	8.0	Volleyball, competitive play in a gymnasium
	15732	4.0	Track and field (shot, discus, hammer throw)
	15733	6.0	Track and field (high jump, long jump, triple jump, javelin, pole vault)
	15734	10.0	Track and field (steeplechase, hurdles)
Transportation	16015	1.0	Riding in a car or truck
	16016	1.0	Riding in a bus
Walking	17031	3.0	Loading/unloading a car
	17085	2.5	Bird watching
	17105	4.0	Pushing a wheelchair, non occupational setting
	17151	2.0	Walking, less than 2.0 mph, level ground, strolling, very slow
	17152	2.5	Walking, 2.0 mph, level, slow pace, firm surface
	17161	2.5	Walking from house to car or bus, from car or bus to go places, from car or bus to and from the work site
	17162	2.5	Walking to neighbor's house or family's house for social reasons
	17165	3.0	Walking the dog
	17231	8.0	Walking, 5.0 mph
	17280	2.5	Walking to and from an outhouse
Water Activities	18025	3.3	Canoeing, harvesting wild rice, knocking rice off the stalks
	18355	4.0	Water aerobics, water calisthenics
	18366	8.0	Water jogging
Religious Activities	20000–20100		Addition of 24 new codes and description of activities
Volunteer Activities	21000–21070		Addition of 19 new codes and description of activities

(Ainsworth et al., 2000, 2011)

CODE	METS	SPECIFIC ACTIVITY	EXAMPLES
01009	8.5	bicycling,	bicycling, BMX or mountain
01010	4.0	bicycling,	bicycling, <10 mph, leisure, to work or for pleasure (Taylor Code 115)
01015	8.0	bicycling,	bicycling, general
01020	6.0	bicycling,	bicycling, 10-11.9 mph, leisure, slow, light effort
01030	8.0	bicycling,	bicycling, 12-13.9 mph, leisure, moderate effort
01040	10.0	bicycling,	bicycling, 14-15.9 mph, racing or leisure, fast, vigorous effort
01050	12.0	bicycling,	bicycling, 16-19 mph, racing/not drafting or >19 mph drafting, very fast, racing general
01060	16.0	bicycling,	bicycling, >20 mph, racing, not drafting
01070	5.0	bicycling,	unicycling
02010	7.0	conditioning exercise,	bicycling, stationary, general
02011	3.0	conditioning exercise,	bicycling, stationary, 50 watts, very light effort
02012	5.5	conditioning exercise,	bicycling, stationary, 100 watts, light effort
02013	7.0	conditioning exercise,	bicycling, stationary, 150 watts, moderate effort
02014	10.5	conditioning exercise,	bicycling, stationary, 200 watts, vigorous effort
02015	12.5	conditioning exercise,	bicycling, stationary, 250 watts, very vigorous effort
02020	8.0	conditioning exercise,	calisthenics (e.g. pushups, situps, pullups, jumping jacks), heavy, vigorous effort
02030	3.5	conditioning exercise,	calisthenics, home exercise, light or moderate effort, general (example: back exercises), going up & down from floor (Taylor Code 150)
02040	8.0	conditioning exercise,	circuit training, including some aerobic movement with minimal rest, general
02050	6.0	conditioning exercise,	weight lifting (free weight, nautilus or universal-type), power lifting or body building, vigorous effort (Taylor Code 210)
02060	5.5	conditioning exercise,	health club exercise, general (Taylor Code 160)
02065	9.0	conditioning exercise,	stair-treadmill ergometer, general
02070	7.0	conditioning exercise,	rowing, stationary ergometer, general
02071	3.5	conditioning exercise,	rowing, stationary, 50 watts, light effort
02072	7.0	conditioning exercise,	rowing, stationary, 100 watts, moderate effort
02073	8.5	conditioning exercise,	rowing, stationary, 150 watts, vigorous effort
02074	12.0	conditioning exercise,	rowing, stationary, 200 watts, very vigorous effort
02080	7.0	conditioning exercise,	ski machine, general
02090	6.0	conditioning exercise,	slimnastics, jazzercise
02100	2.5	conditioning exercise,	stretching, hatha yoga
02101	2.5	conditioning exercise,	mild stretching
02110	6.0	conditioning exercise,	teaching aerobic exercise class
02120	4.0	conditioning exercise,	water aerobics, water calisthenics
02130	3.0	conditioning exercise,	weight lifting (free, nautilus or universal-type), light or moderate effort, light workout, general
02135	1.0	conditioning exercise,	whirlpool, sitting
03010	4.8	dancing,	ballet or modern, twist, jazz, tap, jitterbug
03015	6.5	dancing,	aerobic, general
03016	8.5	dancing,	aerobic, step, with 6 – 8 inch step
03017	10.0	dancing,	aerobic, step, with 10 – 12 inch step
03020	5.0	dancing,	aerobic, low impact
03021	7.0	dancing,	aerobic, high impact
03025	4.5	dancing,	general, Greek, Middle Eastern, hula, flamenco, belly, swing
03030	5.5	dancing,	ballroom, fast (Taylor Code 125)
03031	4.5	dancing,	ballroom, fast (disco, folk, square), line dancing, Irish step dancing, polka, contra, country
03040	3.0	dancing,	ballroom, slow (e.g. waltz, foxtrot, slow dancing), samba, tango, 19th C, mambo, chacha
03050	5.5	dancing,	Anishinaabe Jingle Dancing or other traditional American Indian dancing
04001	3.0	fishing and hunting,	fishing, general

CODE	METS	SPECIFIC ACTIVITY	EXAMPLES
04010	4.0	fishing and hunting,	digging worms, with shovel
04020	4.0	fishing and hunting,	fishing from river bank and walking
04030	2.5	fishing and hunting,	fishing from boat, sitting
04040	3.5	fishing and hunting,	fishing from river bank, standing (Taylor Code 660)
04050	6.0	fishing and hunting,	fishing in stream, in waders (Taylor Code 670)
04060	2.0	fishing and hunting,	fishing, ice, sitting
04070	2.5	fishing and hunting,	hunting, bow and arrow or crossbow
04080	6.0	fishing and hunting,	hunting, deer, elk, large game (Taylor Code 170)
04090	2.5	fishing and hunting,	hunting, duck, wading
04100	5.0	fishing and hunting,	hunting, general
04110	6.0	fishing and hunting,	hunting, pheasants or grouse (Taylor Code 680)
04120	5.0	fishing and hunting,	hunting, rabbit, squirrel, prairie chick, raccoon, small game (Taylor Code 690)
04130	2.5	fishing and hunting,	pistol shooting or trap shooting, standing
05010	3.3	home activities,	carpet sweeping, sweeping floors
05020	3.0	home activities,	cleaning, heavy or major (e.g. wash car, wash windows, clean garage), vigorous effort
05021	3.5	home activities,	mopping
05025	2.5	home activities,	multiple household tasks all at once, light effort
05026	3.5	home activities,	multiple household tasks all at once, moderate effort
05027	4.0	home activities,	multiple household tasks all at once, vigorous effort
05030	3.0	home activities,	cleaning, house or cabin, general
05040	2.5	home activities,	cleaning, light (dusting, straightening up, changing linen, carrying out trash)
05041	2.3	home activities,	wash dishes - standing or in general (not broken into stand/walk components)
05042	2.5	home activities,	wash dishes; clearing dishes from table – walking
05043	3.5	home activities,	vacuuming
05045	6.0	home activities,	butchering animals
05050	2.0	home activities,	cooking or food preparation - standing or sitting or in general (not broken into stand/walk components), manual appliances
05051	2.5	home activities,	serving food, setting table - implied walking or standing
05052	2.5	home activities,	cooking or food preparation - walking
05053	2.5	home activities,	feeding animals
05055	2.5	home activities,	putting away groceries (e.g. carrying groceries, shopping without a grocery cart), carrying packages
05056	7.5	home activities,	carrying groceries upstairs
05057	3.0	home activities,	cooking Indian bread on an outside stove
05060	2.3	home activities,	food shopping with or without a grocery cart, standing or walking
05065	2.3	home activities,	non-food shopping, standing or walking
05070	2.3	home activities,	ironing
05080	1.5	home activities,	sitting - knitting, sewing, lt. wrapping (presents)
05090	2.0	home activities,	implied standing - laundry, fold or hang clothes, put clothes in washer or dryer, packing suitcase
05095	2.3	home activities,	implied walking - putting away clothes, gathering clothes to pack, putting away laundry
05100	2.0	home activities,	making bed
05110	5.0	home activities,	maple syruping/sugar bushing (including carrying buckets, carrying wood)
05120	6.0	home activities,	moving furniture, household items, carrying boxes
05130	3.8	home activities,	scrubbing floors, on hands and knees, scrubbing bathroom, bathtub
05140	4.0	home activities,	sweeping garage, sidewalk or outside of house
05146	3.5	home activities,	standing - packing/unpacking boxes, occasional lifting of household items light - moderate effort
05147	3.0	home activities,	implied walking - putting away household items - moderate effort
05148	2.5	home activities,	watering plants
05149	2.5	home activities,	building a fire inside
05150	9.0	home activities,	moving household items upstairs, carrying boxes or furniture
05160	2.0	home activities,	standing - light (pump gas, change light bulb, etc.)
05165	3.0	home activities,	walking - light, non-cleaning (readying to leave, shut/lock doors, close windows, etc.)

CODE	METS	SPECIFIC ACTIVITY	EXAMPLES
05170	2.5	home activities,	sitting - playing with child(ren) – light, only active periods
05171	2.8	home activities,	standing - playing with child(ren) – light, only active periods
05175	4.0	home activities,	walk/run - playing with child(ren) – moderate, only active periods
05180	5.0	home activities,	walk/run - playing with child(ren) – vigorous, only active periods
05181	3.0	home activities,	carrying small children
05185	2.5	home activities,	child care: sitting/kneeling - dressing, bathing, grooming, feeding, occasional lifting of child-light effort, general
05186	3.0	home activities,	child care: standing - dressing, bathing, grooming, feeding, occasional lifting of child-light effort
05187	4.0	home activities,	elder care, disabled adult, only active periods
05188	1.5	home activities,	reclining with baby
05190	2.5	home activities,	sit, play ing with animals, light, only active periods
05191	2.8	home activities,	stand, playing with animals, light, only active periods
05192	2.8	home activities,	walk/run, playing with animals, light, only active periods
05193	4.0	home activities,	walk/run, playing with animals, moderate, only active periods
05194	5.0	home activities,	walk/run, playing with animals, vigorous, only active periods
05195	3.5	home activities,	standing - bathing dog
06010	3.0	home repair,	airplane repair
06020	4.0	home repair,	automobile body work
06030	3.0	home repair,	automobile repair
06040	3.0	home repair,	carpentry, general, workshop (Taylor Code 620)
06050	6.0	home repair,	carpentry, outside house, installing rain gutters, building a fence, (Taylor Code 640)
06060	4.5	home repair,	carpentry, finishing or refinishing cabinets or furniture
06070	7.5	home repair,	carpentry, sawing hardwood
06080	5.0	home repair,	caulking, chinking log cabin
06090	4.5	home repair,	caulking, except log cabin
06100	5.0	home repair,	cleaning gutters
06110	5.0	home repair,	excavating garage
06120	5.0	home repair,	hanging storm windows
06130	4.5	home repair,	laying or removing carpet
06140	4.5	home repair,	laying tile or linoleum, repairing appliances
06150	5.0	home repair,	painting, outside home (Taylor Code 650)
06160	3.0	home repair,	painting, papering, plastering, scraping, inside house, hanging sheet rock, remodeling
06165	4.5	home repair,	painting, (Taylor Code 630)
06170	3.0	home repair,	put on and removal of tarp - sailboat
06180	6.0	home repair,	roofing
06190	4.5	home repair,	sanding floors with a power sander
06200	4.5	home repair,	scraping and painting sailboat or powerboat
06210	5.0	home repair,	spreading dirt with a shovel
06220	4.5	home repair,	washing and waxing hull of sailboat, car, powerboat, airplane
06230	4.5	home repair,	washing fence, painting fence
06240	3.0	home repair,	wiring, plumbing
07010	1.0	inactivity, quiet	lying quietly and watching television
07011	1.0	inactivity, quiet	lying quietly, doing nothing, lying in bed awake, listening to music (not talking or reading)
07020	1.0	inactivity, quiet	sitting quietly and watching television
07021	1.0	inactivity, quiet	sitting quietly, sitting smoking, listening to music (not talking or reading), watching a movie in a theater
07030	0.9	inactivity, quiet	sleeping
07040	1.2	inactivity, quiet	standing quietly (standing in a line)
07050	1.0	inactivity, light	reclining - writing
07060	1.0	inactivity, light	reclining - talking or talking on phone
07070	1.0	inactivity, light	reclining - reading
07075	1.0	inactivity, light	meditating
08010	5.0	lawn and garden,	carrying, loading or stacking wood, loading/unloading or carrying lumber

CODE	METS	SPECIFIC ACTIVITY	EXAMPLES
08020	6.0	lawn and garden,	chopping wood, splitting logs
08030	5.0	lawn and garden,	clearing land, hauling branches, wheelbarrow chores
08040	5.0	lawn and garden,	digging sandbox
08050	5.0	lawn and garden,	digging, spading, filling garden, composting, (Taylor Code 590)
08060	6.0	lawn and garden,	gardening with heavy power tools, tilling a garden, chain saw
08080	5.0	lawn and garden,	laying crushed rock
08090	5.0	lawn and garden,	laying sod
08095	5.5	lawn and garden,	mowing lawn, general
08100	2.5	lawn and garden,	mowing lawn, riding mower (Taylor Code 550)
08110	6.0	lawn and garden,	mowing lawn, walk, hand mower (Taylor Code 570)
08120	5.5	lawn and garden,	mowing lawn, walk, power mower
08125	4.5	lawn and garden,	mowing lawn, power mower (Taylor Code 590)
08130	4.5	lawn and garden,	operating snow blower, walking
08140	4.5	lawn and garden,	planting seedlings, shrubs
08150	4.5	lawn and garden,	planting trees
08160	4.3	lawn and garden,	raking lawn
08165	4.0	lawn and garden,	raking lawn (Taylor Code 600)
08170	4.0	lawn and garden,	raking roof with snow rake
08180	3.0	lawn and garden,	riding snow blower
08190	4.0	lawn and garden,	sacking grass, leaves
08200	6.0	lawn and garden,	shoveling snow, by hand (Taylor Code 610)
08210	4.5	lawn and garden,	trimming shrubs or trees, manual cutter
08215	3.5	lawn and garden,	trimming shrubs or trees, power cutter, using leaf blower, edger
08220	2.5	lawn and garden,	walking, applying fertilizer or seeding a lawn
08230	1.5	lawn and garden,	watering lawn or garden, standing or walking
08240	4.5	lawn and garden,	weeding, cultivating garden (Taylor Code 580)
08245	4.0	lawn and garden,	gardening, general
08246	3.0	lawn and garden,	picking fruit off trees, picking fruits/vegetables, moderate effort
08250	3.0	lawn and garden,	implied walking/standing - picking up yard, light, picking flowers or vegetables
08251	3.0	lawn and garden,	walking, gathering gardening tools
09010	1.5	miscellaneous,	sitting - card playing, playing board games
09020	2.3	miscellaneous,	standing - drawing (writing), casino gambling, duplicating machine
09030	1.3	miscellaneous,	sitting - reading, book, newspaper, etc.
09040	1.8	miscellaneous,	sitting - writing, desk work, typing
09050	1.8	miscellaneous,	standing - talking or talking on the phone
09055	1.5	miscellaneous,	sitting - talking or talking on the phone
09060	1.8	miscellaneous,	sitting - studying, general, including reading and/or writing
09065	1.8	miscellaneous,	sitting - in class, general, including note-taking or class discussion
09070	1.8	miscellaneous,	standing - reading
09071	2.0	miscellaneous,	standing - miscellaneous
09075	1.5	miscellaneous,	sitting - arts and crafts, light effort
09080	2.0	miscellaneous,	sitting - arts and crafts, moderate effort
09085	1.8	miscellaneous,	standing - arts and crafts, light effort
09090	3.0	miscellaneous,	standing - arts and crafts, moderate effort
09095	3.5	miscellaneous,	standing - arts and crafts, vigorous effort
09100	1.5	miscellaneous,	retreat/family reunion activities involving sitting, relaxing, talking, eating
09105	2.0	miscellaneous,	touring/traveling/vacation involving walking and riding
09110	2.5	miscellaneous,	camping involving standing, walking, sitting, light-to-moderate effort
09115	1.5	miscellaneous,	sitting at a sporting event, spectator
10010	1.8	music playing,	accordion
10020	2.0	music playing,	cello

CODE	METS	SPECIFIC ACTIVITY	EXAMPLES
11615	4.0	occupation,	lifting items continuously, 10 – 20 lbs, with limited walking or resting
11620	3.5	occupation,	standing; moderate (assembling at fast rate, intermittent, lifting 50 lbs, hitch/twisting ropes)
11630	4.0	occupation,	standing; moderate/heavy (lifting more than 50 lbs, masonry, painting, paper hanging)
11640	5.0	occupation,	steel mill, fettling
11650	5.5	occupation,	steel mill, forging
11660	8.0	occupation,	steel mill, hand rolling
11670	8.0	occupation,	steel mill, merchant mill rolling
11680	11.0	occupation,	steel mill, removing slag
11690	7.5	occupation,	steel mill, tending furnace
11700	5.5	occupation,	steel mill, tipping molds
11710	8.0	occupation,	steel mill, working in general
11720	2.5	occupation,	tailoring, cutting
11730	2.5	occupation,	tailoring, general
11740	2.0	occupation,	tailoring, hand sewing
11750	2.5	occupation,	tailoring, machine sewing
11760	4.0	occupation,	tailoring, pressing
11765	3.5	occupation,	tailoring, weaving
11766	6.5	occupation,	truck driving, loading and unloading truck (standing)
11770	1.5	occupation,	typing, electric, manual or computer
11780	6.0	occupation,	using heavy power tools such as pneumatic tools (jackhammers, drills, etc.)
11790	8.0	occupation,	using heavy tools (not power) such as shovel, pick, tunnel bar, spade
11791	2.0	occupation,	walking on job, less than 2.0 mph (in office or lab area), very slow
11792	3.3	occupation,	walking on job, 3.0 mph, in office, moderate speed, not carrying anything
11793	3.8	occupation,	walking on job, 3.5 mph, in office, brisk speed, not carrying anything
11795	3.0	occupation,	walking, 2.5 mph, slowly and carrying light objects less than 25 pounds
11796	3.0	occupation,	walking, gathering things at work, ready to leave
11800	4.0	occupation,	walking, 3.0 mph, moderately and carrying light objects less than 25 lbs
11805	4.0	occupation,	walking, pushing a wheelchair
11810	4.5	occupation,	walking, 3.5 mph, briskly and carrying objects less than 25 pounds
11820	5.0	occupation,	walking or walk downstairs or standing, carrying objects about 25 to 49 pounds
11830	6.5	occupation,	walking or walk downstairs or standing, carrying objects about 50 to 74 pounds
11840	7.5	occupation,	walking or walk downstairs or standing, carrying objects about 75 to 99 pounds
11850	8.5	occupation,	walking or walk downstairs or standing, carrying objects about 100 pounds or over
11870	3.0	occupation,	working in scene shop, theater actor, backstage employee
11875	4.0	occupation,	teach physical education, exercise, sports classes (non-sport play)
11876	6.5	occupation,	teach physical education, exercise, sports classes (participate in the class)
12010	6.0	running,	jog/walk combination (jogging component of less than 10 minutes) (Taylor Code 180)
12020	7.0	running,	jogging, general
12025	8.0	running,	jogging, in place
12027	4.5	running	jogging on a mini-tramp
12030	8.0	running,	running, 5 mph (12 min/mile)
12040	9.0	running,	running, 5.2 mph (11.5 min/mile)
12050	10.0	running,	running, 6 mph (10 min/mile)
12060	11.0	running,	running, 6.7 mph (9 min/mile)
12070	11.5	running,	running, 7 mph (8.5 min/mile)
12080	12.5	running,	running, 7.5 mph (8 min/mile)
12090	13.5	running,	running, 8 mph (7.5 min/mile)
12100	14.0	running,	running, 8.6 mph (7 min/mile)
12110	15.0	running,	running, 9 mph (6.5 min/mile)
12120	16.0	running,	running, 10 mph (6 min/mile)
12130	18.0	running,	running, 10.9 mph (5.5 min/mile)

CODE	METS	SPECIFIC ACTIVITY	EXAMPLES
12140	9.0	running,	running, cross country
12150	8.0	running,	running (Taylor Code 200)
12170	15.0	running,	running, stairs, up
12180	10.0	running,	running, on a track, team practice
12190	8.0	running,	running, training, pushing a wheelchair
13000	2.0	self care,	standing - getting ready for bed, in general
13009	1.0	self care,	sitting on toilet
13010	1.5	self care,	bathing (sitting)
13020	2.0	self care,	dressing, undressing (standing or sitting)
13030	1.5	self care,	eating (sitting)
13035	2.0	self care,	talking and eating or eating only (standing)
13036	1.0	self care,	taking medication, sitting or standing
13040	2.0	self care,	grooming (washing, shaving, brushing teeth, urinating, washing hands, putting on make-up), sitting or standing
13045	2.5	self care,	hairstyling
13046	1.0	self care,	having hair or nails done by someone else, sitting
13050	2.0	self care,	showering, toweling off (standing)
14010	1.5	sexual activity,	active, vigorous effort
14020	1.3	sexual activity,	general, moderate effort
14030	1.0	sexual activity,	passive, light effort, kissing, hugging
15010	3.5	sports,	archery (non-hunting)
15020	7.0	sports,	badminton, competitive (Taylor Code 450)
15030	4.5	sports,	badminton, social singles and doubles, general
15040	8.0	sports,	basketball, game (Taylor Code 490)
15050	6.0	sports,	basketball, non-game, general (Taylor Code 480)
15060	7.0	sports,	basketball, officiating (Taylor Code 500)
15070	4.5	sports,	basketball, shooting baskets
15075	6.5	sports,	basketball, wheelchair
15080	2.5	sports,	billiards
15090	3.0	sports,	bowling (Taylor Code 390)
15100	12.0	sports,	boxing, in ring, general
15110	6.0	sports,	boxing, punching bag
15120	9.0	sports,	boxing, sparring
15130	7.0	sports,	broomball
15135	5.0	sports,	children's games (hopscotch, 4-square, dodge ball, playground apparatus, t-ball, tetherball, marbles, jacks, acrace games)
15140	4.0	sports,	coaching: football, soccer, basketball, baseball, swimming, etc.
15150	5.0	sports,	cricket (batting, bowling)
15160	2.5	sports,	croquet
15170	4.0	sports,	curling
15180	2.5	sports,	darts, wall or lawn
15190	6.0	sports,	drag racing, pushing or driving a car
15200	6.0	sports,	fencing
15210	9.0	sports,	football, competitive
15230	8.0	sports,	football, touch, flag, general (Taylor Code 510)
15235	2.5	sports,	football or baseball, playing catch
15240	3.0	sports,	frisbee playing, general
15250	8.0	sports,	frisbee, ultimate
15255	4.5	sports,	golf, general
15265	4.5	sports,	golf, walking and carrying clubs (See footnote at end of the Compendium)
15270	3.0	sports,	golf, miniature, driving range
15285	4.3	sports,	golf, walking and pulling clubs (See footnote at end of the Compendium)

CODE	METS	SPECIFIC ACTIVITY	EXAMPLES
15290	3.5	sports,	golf, using power cart (Taylor Code 070)
15300	4.0	sports,	gymnastics, general
15310	4.0	sports,	hacky sack
15320	12.0	sports,	handball, general (Taylor Code 520)
15330	8.0	sports,	handball, team
15340	3.5	sports,	hand gliding
15350	8.0	sports,	hockey, field
15360	8.0	sports,	hockey, ice
15370	4.0	sports,	horseback riding, general
15380	3.5	sports,	horseback riding, saddling horse, grooming horse
15390	6.5	sports,	horseback riding, trotting
15400	2.5	sports,	horseback riding, walking
15410	3.0	sports,	horseshoe pitching, quoits
15420	12.0	sports,	jai alai
15430	10.0	sports,	judo, jujitsu, karate, kick boxing, tae kwan do
15440	4.0	sports,	juggling
15450	7.0	sports,	kickball
15460	8.0	sports,	lacrosse
15470	4.0	sports,	motor-cross
15480	9.0	sports,	orienteering
15490	10.0	sports,	paddleball, competitive
15500	6.0	sports,	paddleball, casual, general (Taylor Code 460)
15510	8.0	sports,	polo
15520	10.0	sports,	racquetball, competitive
15530	7.0	sports,	racquetball, casual, general (Taylor Code 470)
15535	11.0	sports,	rock climbing, ascending rock
15540	8.0	sports,	rock climbing, rappelling
15550	12.0	sports,	rope jumping, fast
15551	10.0	sports,	rope jumping, moderate, general
15552	8.0	sports,	rope jumping, slow
15560	10.0	sports,	rugby
15570	3.0	sports,	shuffleboard, lawn bowling
15580	5.0	sports,	skateboarding
15590	7.0	sports,	skating, roller (Taylor Code 360)
15591	12.5	sports,	roller blading (in-line skating)
15600	3.5	sports,	sky diving
15605	10.0	sports,	soccer, competitive
15610	7.0	sports,	soccer, casual, general (Taylor Code 540)
15620	5.0	sports,	softball or baseball, fast or slow pitch, general (Taylor Code 440)
15630	4.0	sports,	softball, officiating
15640	6.0	sports,	softball, pitching
15650	12.0	sports,	squash (Taylor Code 530)
15660	4.0	sports,	table tennis, ping pong (Taylor Code 410)
15670	4.0	sports,	tai chi
15675	7.0	sports,	tennis, general
15680	6.0	sports,	tennis, doubles (Taylor Code 430)
15685	5.0	sports,	tennis, doubles
15690	8.0	sports,	tennis, singles (Taylor Code 420)
15700	3.5	sports,	trampoline
15710	4.0	sports,	volleyball (Taylor Code 400)
15711	8.0	sports,	volleyball, competitive, in gymnasium

CODE	METS	SPECIFIC ACTIVITY	EXAMPLES
15720	3.0	sports,	volleyball, non-competitive, 6 - 9 member team, general
15725	8.0	sports,	volleyball, beach
15730	6.0	sports,	wrestling (one match = 5 minutes)
15731	7.0	sports,	wallyball, general
15732	4.0	sports,	track and field (shot, discus, hammer throw)
15733	6.0	sports,	track and field (high jump, long jump, triple jump, javelin, pole vault)
15734	10.0	sports,	track and field (steeplechase, hurdles)
16010	2.0	transportation,	automobile or light truck (not a semi) driving
16015	1.0	transportation,	riding in a car or truck
16016	1.0	transportation,	riding in a bus
16020	2.0	transportation,	flying airplane
16030	2.5	transportation,	motor scooter, motorcycle
16040	6.0	transportation,	pushing plane in and out of hangar
16050	3.0	transportation,	driving heavy truck, tractor, bus
17010	7.0	walking,	backpacking (Taylor Code 050)
17020	3.5	walking,	carrying infant or 15 pound load (e.g. suitcase), level ground or downstairs
17025	9.0	walking,	carrying load upstairs, general
17026	5.0	walking,	carrying 1 to 15 lb load, upstairs
17027	6.0	walking,	carrying 16 to 24 lb load, upstairs
17028	8.0	walking,	carrying 25 to 49 lb load, upstairs
17029	10.0	walking,	carrying 50 to 74 lb load, upstairs
17030	12.0	walking,	carrying 74+ lb load, upstairs
17031	3.0	walking,	loading /unloading a car
17035	7.0	walking,	climbing hills with 0 to 9 pound load
17040	7.5	walking,	climbing hills with 10 to 20 pound load
17050	8.0	walking,	climbing hills with 21 to 42 pound load
17060	9.0	walking,	climbing hills with 42+ pound load
17070	3.0	walking,	downstairs
17080	6.0	walking,	hiking, cross country (Taylor Code 040)
17085	2.5	walking,	bird watching
17090	6.5	walking,	marching, rapidly, military
17100	2.5	walking,	pushing or pulling stroller with child or walking with children
17105	4.0	walking,	pushing a wheelchair, non-occupational setting
17110	6.5	walking,	race walking
17120	8.0	walking,	rock or mountain climbing (Taylor Code 060)
17130	8.0	walking,	up stairs, using or climbing up ladder (Taylor Code 030)
17140	5.0	walking,	using crutches
17150	2.0	walking,	walking, household
17151	2.0	walking,	walking, less than 2.0 mph, level ground, strolling, very slow
17152	2.5	walking,	walking, 2.0 mph, level, slow pace, firm surface
17160	3.5	walking,	walking for pleasure (Taylor Code 010)
17161	2.5	walking,	walking from house to car or bus, from car or bus to go places, from car or bus to and from the worksite
17162	2.5	walking,	walking to neighbor's house or family's house for social reasons
17165	3.0	walking,	walking the dog
17170	3.0	walking,	walking, 2.5 mph, firm surface
17180	2.8	walking,	walking, 2.5 mph, downhill
17190	3.3	walking,	walking, 3.0 mph, level, moderate pace, firm surface
17200	3.8	walking,	walking, 3.5 mph, level, brisk, firm surface, walking for exercise
17210	6.0	walking,	walking, 3.5 mph, uphill
17220	5.0	walking,	walking, 4.0 mph, level, firm surface, very brisk pace
17230	6.3	walking,	walking, 4.5 mph, level, firm surface, very, very brisk

CODE	METS	SPECIFIC ACTIVITY	EXAMPLES
17231	8.0	walking,	walking, 5.0 mph
17250	3.5	walking,	walking, for pleasure, work break
17260	5.0	walking,	walking, grass track
17270	4.0	walking,	walking, to work or class (Taylor Code 015)
17280	2.5	walking,	walking to and from an outhouse
18010	2.5	water activities,	boating, power
18020	4.0	water activities,	canoeing, on camping trip (Taylor Code 270)
18025	3.3	water activities,	canoeing, harvesting wild rice, knocking rice off the stalks
18030	7.0	water activities,	canoeing, portaging
18040	3.0	water activities,	canoeing, rowing, 2.0-3.9 mph, light effort
18050	7.0	water activities,	canoeing, rowing, 4.0-5.9 mph, moderate effort
18060	12.0	water activities,	canoeing, rowing, >6 mph, vigorous effort
18070	3.5	water activities,	canoeing, rowing, for pleasure, general (Taylor Code 250)
18080	12.0	water activities,	canoeing, rowing, in competition, or crew or sculling (Taylor Code 260)
18090	3.0	water activities,	diving, springboard or platform
18100	5.0	water activities,	kayaking
18110	4.0	water activities,	paddle boat
18120	3.0	water activities,	sailing, boat and board sailing, windsurfing, ice sailing, general (Taylor Code 235)
18130	5.0	water activities,	sailing, in competition
18140	3.0	water activities,	sailing, Sunfish/Laser/Hobby Cat, Keel boats, ocean sailing, yachting
18150	6.0	water activities,	skiing, water (Taylor Code 220)
18160	7.0	water activities,	skimobiling
18180	16.0	water activities,	skindiving, fast
18190	12.5	water activities,	skindiving, moderate
18200	7.0	water activities,	skindiving, scuba diving, general (Taylor Code 310)
18210	5.0	water activities,	snorkeling (Taylor Code 320)
18220	3.0	water activities,	surfing, body or board
18230	10.0	water activities,	swimming laps, freestyle, fast, vigorous effort
18240	7.0	water activities,	swimming laps, freestyle, slow, moderate or light effort
18250	7.0	water activities,	swimming, backstroke, general
18260	10.0	water activities,	swimming, breaststroke, general
18270	11.0	water activities,	swimming, butterfly, general
18280	11.0	water activities,	swimming, crawl, fast (75 yards/minute), vigorous effort
18290	8.0	water activities,	swimming, crawl, slow (50 yards/minute), moderate or light effort
18300	6.0	water activities,	swimming, lake, ocean, river (Taylor Codes 280, 295)
18310	6.0	water activities,	swimming, leisurely, not lap swimming, general
18320	8.0	water activities,	swimming, sidestroke, general
18330	8.0	water activities,	swimming, synchronized
18340	10.0	water activities,	swimming, treading water, fast vigorous effort
18350	4.0	water activities,	swimming, treading water, moderate effort, general
18355	4.0	water activities,	water aerobics, water calisthenics
18360	10.0	water activities,	water polo
18365	3.0	water activities,	water volleyball
18366	8.0	water activities,	water jogging
18370	5.0	water activities,	whitewater rafting, kayaking, or canoeing
19010	6.0	winter activities,	moving ice house (set up/drill holes, etc.)
19020	5.5	winter activities,	skating, ice, 9 mph or less
19030	7.0	winter activities,	skating, ice, general (Taylor Code 360)
19040	9.0	winter activities,	skating, ice, rapidly, more than 9 mph
19050	15.0	winter activities,	skating, speed, competitive
19060	7.0	winter activities,	ski jumping (climb up carrying skis)

CODE	METS	SPECIFIC ACTIVITY	EXAMPLES
19075	7.0	winter activities,	skiing, general
19080	7.0	winter activities,	skiing, cross country, 2.5 mph, slow or light effort, ski walking
19090	8.0	winter activities,	skiing, cross country, 4.0-4.9 mph, moderate speed and effort, general
19100	9.0	winter activities,	skiing, cross country, 5.0-7.9 mph, brisk speed, vigorous effort
19110	14.0	winter activities,	skiing, cross country, >8.0 mph, racing
19130	16.5	winter activities,	skiing, cross country, hard snow, uphill, maximum, snow mountaineering
19150	5.0	winter activities,	skiing, downhill, light effort
19160	6.0	winter activities,	skiing, downhill, moderate effort, general
19170	8.0	winter activities,	skiing, downhill, vigorous effort, racing
19180	7.0	winter activities,	sledding, tobogganing, bobsledding, luge (Taylor Code 370)
19190	8.0	winter activities,	snow shoeing
19200	3.5	winter activities,	snowmobiling
20000	1.0	religious activities,	sitting in church, in service, attending a ceremony, sitting quietly
20001	2.5	religious activities,	sitting, playing an instrument at church
20005	1.5	religious activities,	sitting in church, talking or singing, attending a ceremony, sitting, active participation
20010	1.3	religious activities,	sitting, reading religious materials at home
20015	1.2	religious activities,	standing in church (quietly), attending a ceremony, standing quietly
20020	2.0	religious activities,	standing, singing in church, attending a ceremony, standing, active participation
20025	1.0	religious activities,	kneeling in church/at home (praying)
20030	1.8	religious activities,	standing, talking in church
20035	2.0	religious activities,	walking in church
20036	2.0	religious activities,	walking, less than 2.0 mph - very slow
20037	3.3	religious activities,	walking, 3.0 mph, moderate speed, not carrying anything
20038	3.8	religious activities,	walking, 3.5 mph, brisk speed, not carrying anything
20039	2.0	religious activities,	walk/stand combination for religious purposes, usher
20040	5.0	religious activities,	praise with dance or run, spiritual dancing in church
20045	2.5	religious activities,	serving food at church
20046	2.0	religious activities,	preparing food at church
20047	2.3	religious activities,	washing dishes/cleaning kitchen at church
20050	1.5	religious activities,	eating at church
20055	2.0	religious activities,	eating/talking at church or standing eating, American Indian Feast days
20060	3.0	religious activities,	cleaning church
20061	5.0	religious activities,	general yard work at church
20065	2.5	religious activities,	standing - moderate (lifting 50 lbs., assembling at fast rate)
20095	4.0	religious activities,	standing - moderate/heavy work
20100	1.5	religious activities,	typing, electric, manual, or computer
21000	1.5	volunteer activities,	sitting - meeting, general, and/or with talking involved
21005	1.5	volunteer activities,	sitting - light office work, in general
21010	2.5	volunteer activities,	sitting - moderate work
21015	2.3	volunteer activities,	standing - light work (filing, talking, assembling)
21016	2.5	volunteer activities,	sitting, child care, only active periods
21017	3.0	volunteer activities,	standing, child care, only active periods
21018	4.0	volunteer activities,	walk/run play with children, moderate, only active periods
21019	5.0	volunteer activities,	walk/run play with children, vigorous, only active periods
21020	3.0	volunteer activities,	standing - light/moderate work (pack boxes, assemble/repair, set up chairs/furniture)
21025	3.5	volunteer activities,	standing - moderate (lifting 50 lbs., assembling at fast rate)
21030	4.0	volunteer activities,	standing - moderate/heavy work
21035	1.5	volunteer activities,	typing, electric, manual, or computer
21040	2.0	volunteer activities,	walking, less than 2.0 mph, very slow
21045	3.3	volunteer activities,	walking, 3.0 mph, moderate speed, not carrying anything
21050	3.8	volunteer activities,	walking, 3.5 mph, brisk speed, not carrying anything
21055	3.0	volunteer activities,	walking, 2.5 mph slowly and carrying objects less than 25 pounds
21060	4.0	volunteer activities,	walking, 3.0 mph moderately and carrying objects less than 25 pounds, pushing someth

10.5. Appendix 5: PA Recommendations

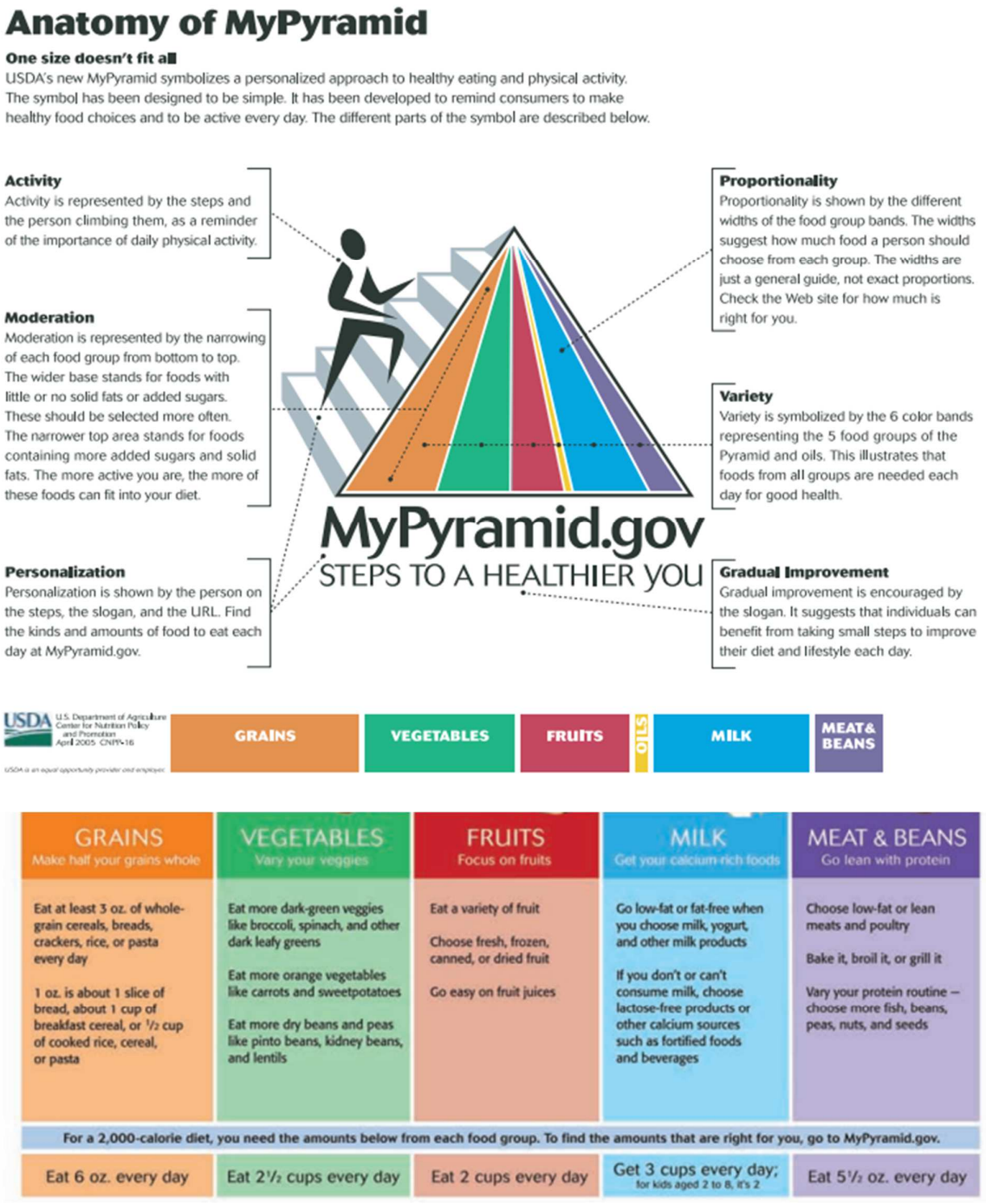
BOX 13.1 US RECOMMENDATIONS FOR PHYSICAL ACTIVITY TO MAINTAIN AND IMPROVE THE HEALTH OF ADULTS 2007

- Adults aged 18–65 need moderate-intensity aerobic activity for a minimum of 30 minutes on five days each week or vigorous-intensity aerobic activity for a minimum of 20 minutes on three days each week.
- Combinations of moderate and vigorous activity can be performed because these are complementary in the production of health benefits.
- Moderate-intensity activities, generally equivalent to a brisk walk, can be accumulated toward the 30-minute minimum by performing bouts each lasting ten or more minutes.
- In addition, every adult should perform activities that maintain or increase muscular strength and muscular endurance on a minimum of two days each week.
- Further benefits (increased personal fitness, reduction of the risk for chronic diseases, avoidance of unhealthy weight gain) may be gained by exceeding the minimum recommendations.
- Differences in recommendations for older adults aged 65+ and for those aged 50–64 who are in receipt of regular medical care and treatment for a chronic condition or have functional limitations that limit movement are that:
  - Moderate intensity should be related to individual level of aerobic fitness.
  - Older adults should, in addition, undertake activities to maintain or increase flexibility and balance.
  - Activity plans should integrate preventive and therapeutic recommendations.

Sources: (Haskell *et al.* 2007) and (Nelson *et al.* 2007).

(Nelson et al., 2007; Haskell et al., 2007)

10.6. Appendix 6: My Pyramid



(Dunford & Doyle, 2007); (www. MyPyramid.gov/professionals/food_tracking_wksht. html).

10.7. Appendix 7: IPAQ QUESTIONNAIRE

INTERNATIONAL PHYSICAL ACTIVITY QUESTIONNAIRE (October 2002)

LONG LAST 7 DAYS SELF-ADMINISTERED FORMAT

FOR USE WITH YOUNG AND MIDDLE-AGED ADULTS (15-69 years)

The International Physical Activity Questionnaires (IPAQ) comprises a set of 4 questionnaires. Long (5 activity domains asked independently) and short (4 generic items) versions for use by either telephone or self-administered methods are available. The purpose of the questionnaires is to provide common instruments that can be used to obtain internationally comparable data on health–related physical activity.

Background on IPAQ

The development of an international measure for physical activity commenced in Geneva in 1998 and was followed by extensive reliability and validity testing undertaken across 12 countries (14 sites) during 2000. The final results suggest that these measures have acceptable measurement properties for use in many settings and in different languages, and are suitable for national population-based prevalence studies of participation in physical activity.

Using IPAQ

Use of the IPAQ instruments for monitoring and research purposes is encouraged. It is recommended that no changes be made to the order or wording of the questions as this will affect the psychometric properties of the instruments.

Translation from English and Cultural Adaptation

Translation from English is encouraged to facilitate worldwide use of IPAQ. Information on the availability of IPAQ in different languages can be obtained at www.ipaq.ki.se. If a new translation is undertaken we highly recommend using the prescribed back translation methods available on the IPAQ website. If possible please consider making your translated version of IPAQ available to others by contributing it to the IPAQ website. Further details on translation and cultural adaptation can be downloaded from the website.

Further Developments of IPAQ

International collaboration on IPAQ is on-going and an ***International Physical Activity Prevalence Study*** is in progress. For further information see the IPAQ website.

More Information

More detailed information on the IPAQ process and the research methods used in the development of IPAQ instruments is available at www.ipaq.ki.se and Booth, M.L. (2000). *Assessment of Physical Activity: An International Perspective*. Research Quarterly for Exercise and Sport, 71 (2): s114-20. Other scientific publications and presentations on the use of IPAQ are summarized on the website.

INTERNATIONAL PHYSICAL ACTIVITY QUESTIONNAIRE

We are interested in finding out about the kinds of physical activities that people do as part of their everyday lives. The questions will ask you about the time you spent being physically active in the **last 7 days**. Please answer each question even if you do not consider yourself to be an active person. Please think about the activities you do at work, as part of your house and yard work, to get from place to place, and in your spare time for recreation, exercise or sport.

Think about all the **vigorous** and **moderate** activities that you did in the **last 7 days**. **Vigorous** physical activities refer to activities that take hard physical effort and make you breathe much harder than normal. **Moderate** activities refer to activities that take moderate physical effort and make you breathe somewhat harder than normal.

PART 1: JOB-RELATED PHYSICAL ACTIVITY

The first section is about your work. This includes paid jobs, farming, volunteer work, course work, and any other unpaid work that you did outside your home. Do not include unpaid work you might do around your home, like housework, yard work, general maintenance, and caring for your family. These are asked in Part 3.

1. Do you currently have a job or do any unpaid work outside your home?

   ☐ Yes

   ☐ No → ***Skip to PART 2: TRANSPORTATION***

The next questions are about all the physical activity you did in the **last 7 days** as part of your paid or unpaid work. This does not include traveling to and from work.

2. During the **last 7 days**, on how many days did you do **vigorous** physical activities like heavy lifting, digging, heavy construction, or climbing up stairs **as part of your work**? Think about only those physical activities that you did for at least 10 minutes at a time.

   _____ **days per week**

   ☐ No vigorous job-related physical activity → ***Skip to question 4***

3. How much time did you usually spend on one of those days doing **vigorous** physical activities as part of your work?

   _____ **hours per day**
   _____ **minutes per day**

4. Again, think about only those physical activities that you did for at least 10 minutes at a time. During the **last 7 days**, on how many days did you do **moderate** physical activities like carrying light loads **as part of your work**? Please do not include walking.

   _____ **days per week**

   ☐ No moderate job-related physical activity → ***Skip to question 6***

5. How much time did you usually spend on one of those days doing **moderate** physical activities as part of your work?

_____ **hours per day**
_____ **minutes per day**

6. During the **last 7 days**, on how many days did you **walk** for at least 10 minutes at a time **as part of your work**? Please do not count any walking you did to travel to or from work.

_____ **days per week**

☐ No job-related walking → ***Skip to PART 2: TRANSPORTATION***

7. How much time did you usually spend on one of those days **walking** as part of your work?

_____ **hours per day**
_____ **minutes per day**

PART 2: TRANSPORTATION PHYSICAL ACTIVITY

These questions are about how you traveled from place to place, including to places like work, stores, movies, and so on.

8. During the **last 7 days**, on how many days did you **travel in a motor vehicle** like a train, bus, car, or tram?

_____ **days per week**

☐ No traveling in a motor vehicle → ***Skip to question 10***

9. How much time did you usually spend on one of those days **traveling** in a train, bus, car, tram, or other kind of motor vehicle?

_____ **hours per day**
_____ **minutes per day**

Now think only about the **bicycling** and **walking** you might have done to travel to and from work, to do errands, or to go from place to place.

10. During the **last 7 days**, on how many days did you **bicycle** for at least 10 minutes at a time to go **from place to place**?

_____ **days per week**

☐ No bicycling from place to place → ***Skip to question 12***

11. How much time did you usually spend on one of those days to **bicycle** from place to place?

_____ **hours per day**
_____ **minutes per day**

12. During the **last 7 days**, on how many days did you **walk** for at least 10 minutes at a time to go **from place to place**?

_____ **days per week**

☐ No walking from place to place → ***Skip to PART 3: HOUSEWORK, HOUSE MAINTENANCE, AND CARING FOR FAMILY***

13. How much time did you usually spend on one of those days **walking** from place to place?

_____ **hours per day**
_____ **minutes per day**

PART 3: HOUSEWORK, HOUSE MAINTENANCE, AND CARING FOR FAMILY

This section is about some of the physical activities you might have done in the **last 7 days** in and around your home, like housework, gardening, yard work, general maintenance work, and caring for your family.

14. Think about only those physical activities that you did for at least 10 minutes at a time. During the **last 7 days**, on how many days did you do **vigorous** physical activities like heavy lifting, chopping wood, shoveling snow, or digging **in the garden or yard**?

_____ **days per week**

☐ No vigorous activity in garden or yard → ***Skip to question 16***

15. How much time did you usually spend on one of those days doing **vigorous** physical activities in the garden or yard?

_____ **hours per day**
_____ **minutes per day**

16. Again, think about only those physical activities that you did for at least 10 minutes at a time. During the **last 7 days**, on how many days did you do **moderate** activities like carrying light loads, sweeping, washing windows, and raking **in the garden or yard**?

_____ **days per week**

☐ No moderate activity in garden or yard → ***Skip to question 18***

17. How much time did you usually spend on one of those days doing **moderate** physical activities in the garden or yard?

_____ **hours per day**
_____ **minutes per day**

18. Once again, think about only those physical activities that you did for at least 10 minutes at a time. During the **last 7 days**, on how many days did you do **moderate** activities like carrying light loads, washing windows, scrubbing floors and sweeping **inside your home**?

_____ **days per week**

☐ No moderate activity inside home → ***Skip to PART 4: RECREATION, SPORT AND LEISURE-TIME PHYSICAL ACTIVITY***

19. How much time did you usually spend on one of those days doing **moderate** physical activities inside your home?

_____ **hours per day**
_____ **minutes per day**

PART 4: RECREATION, SPORT, AND LEISURE-TIME PHYSICAL ACTIVITY

This section is about all the physical activities that you did in the **last 7 days** solely for recreation, sport, exercise or leisure. Please do not include any activities you have already mentioned.

20. Not counting any walking you have already mentioned, during the **last 7 days**, on how many days did you **walk** for at least 10 minutes at a time **in your leisure time**?

_____ **days per week**

☐ No walking in leisure time → ***Skip to question 22***

21. How much time did you usually spend on one of those days **walking** in your leisure time?

_____ **hours per day**
_____ **minutes per day**

22. Think about only those physical activities that you did for at least 10 minutes at a time. During the **last 7 days**, on how many days did you do **vigorous** physical activities like aerobics, running, fast bicycling, or fast swimming **in your leisure time**?

_____ **days per week**

☐ No vigorous activity in leisure time → ***Skip to question 24***

23. How much time did you usually spend on one of those days doing **vigorous** physical activities in your leisure time?

_____ **hours per day**
_____ **minutes per day**

24. Again, think about only those physical activities that you did for at least 10 minutes at a time. During the **last 7 days**, on how many days did you do **moderate** physical activities like bicycling at a regular pace, swimming at a regular pace, and doubles tennis **in your leisure time**?

_____ **days per week**

☐ No moderate activity in leisure time → ***Skip to PART 5: TIME SPENT SITTING***

25. How much time did you usually spend on one of those days doing **moderate** physical activities in your leisure time?
_____ **hours per day**
_____ **minutes per day**

PART 5: TIME SPENT SITTING

The last questions are about the time you spend sitting while at work, at home, while doing course work and during leisure time. This may include time spent sitting at a desk, visiting friends, reading or sitting or lying down to watch television. Do not include any time spent sitting in a motor vehicle that you have already told me about.

26. During the **last 7 days**, how much time did you usually spend **sitting** on a **weekday**?

_____ **hours per day**
_____ **minutes per day**

27. During the **last 7 days**, how much time did you usually spend **sitting** on a **weekend day**?

_____ **hours per day**
_____ **minutes per day**

This is the end of the questionnaire, thank you for participating.

10.8. Appendix 8: Dietary Habits Survey

10.8.1. Table A1. Food frequency consumption (Turconi et al., 2003)

B1.	Do you drink milk/milk and coffee/cappuccino or do you eat yogurt every day?	☐ yes
		☐ no
B2.	If yes, how many glasses/cups of milk/milk and coffee/cappuccino/yogurt do you consume every day?	☐ 1–2
		☐ 3–4
		☐ more than 4
B3	If no, how many times do you consume milk/milk and coffee/cappuccino/yogurt during 1 week?	☐ 1–2
		☐ 3–4
		☐ more than 4
		☐ 1 time in 10–15 days
		☐ never
B4.	Do you eat pasta/rice/bread/potatoes every day?	☐ yes
		☐ no
B5.	If yes, how many portions (250 g, cooked and dressed) of pasta/rice/bread/potatoes do you eat every day?	☐ 1–2
		☐ 3–4
		☐ more than 4
B6.	If no, how many times do you eat pasta/rice/bread/potatoes during 1 week?	☐ 1–2
		☐ 3–4
		☐ more than 4
		☐ 1 time in 10–15 days
		☐ never
B7.	Do you eat fruit and vegetable every day?	☐ yes
		☐ no

B8.	If yes, how many portions (200 g) of fruit and vegetables do you eat every day?	☐ 1–2
		☐ 3–4
		☐ more than 4
B9.	If no, how many times do you eat fruit and vegetables during 1 week?	☐ 1–2
		☐ 3–4
		☐ more than 4
		☐ 1 time in 10–15 days
		☐ never
B10.	How many times do you eat meat in 1 week?	☐ 1–2
		☐ 3–4
		☐ 1 time every day
		☐ 2 times every day
		☐ 1 time in 10–15 days
		☐ never
B11.	How many times do you eat fish in 1 week?	☐ 1–2
		☐ 3–4
		☐ more than 4
		☐ 1 time in 10–15 days
		☐ never
B12.	How many times do you eat eggs in 1 week?	☐ 1–2
		☐ 3–4
		☐ more than 4
		☐ 1 time in 10–15 days
		☐ never
B13.	How many times do you eat cheese in 1 week?	☐ 1–2
		☐ 3–4
		☐ more than 4
		☐ 1 time in 10–15 days
		☐ never
B14.	How many times do you eat ham, salami and sausages in 1 week?	☐ 1–2
		☐ 3–4

		☐ more than 4
		☐ 1 time in 10–15 days
		☐ never
B15.	How many times do you eat legumes in 1 week?	☐ 1–2
		☐ 3–4
		☐ more than 4
		☐ 1 time in 10–15 days
		☐ never
B16.	How many times do you eat sweets and cakes in 1 week?	☐ 1–2
		☐ 3–4
		☐ 1 time every day
		☐ more than 1 time daily
		☐ 1 time in 10–15 days
		☐ never
B17.	How many times do you eat fried potatoes in 1 week?	☐ 1–2
		☐ 3–4
		☐ 1 time every day
		☐ 2 times every day
		☐ 1 time in 10–15 days
		☐ never
B18.	How times do you eat in a fast-food in 1 week?	☐ 1–2
		☐ more than 2 times
		☐ 1 time in 10–15 days
		☐ never
B19.	How many times do you eat in a pizzeria in 1 week?	☐ 1–2
		☐ more than 2 times

10.8.2. Table A2. Food habits

C1.	Do you eat breakfast?	☐ always
		☐ often
		☐ sometimes
		☐ never
C2.	Which beverage do you consume at breakfast?	☐ milk/milk and coffee/cappuccino/yogurt
		☐ fruit juice
		☐ tea/coffee
		☐ chocolate
C3.	At breakfast you eat:	☐ biscuits/cakes/crackers/ breakfast cereals/bread
		☐ fruit
		☐ sausages and cheese
		☐ pizza/focaccia/toast
C4.	Do you eat at least 2 portions (200 g) of fruit every day?	☐ always
		☐ often
		☐ sometimes
		☐ never
C5.	Do you eat at least 2 portions (200 g) of vegetables every day?	☐ always
		☐ often
		☐ sometimes
		☐ never
C6.	Do you usually eat a cake or a dessert at meals?	☐ always
		☐ often
C7.	Do you usually eat breakfast, lunch and dinner every day?	☐ sometimes ☐ never ☐ always
		☐ often
		☐ sometimes
		☐ never
C8.	Your diet:	
	☐ is different every day	
	☐ is different only sometimes during a week	
	☐ is different only during the weekend days	

	☐ is very monotonous	
C9.	Your diet is based mainly on:	
	☐ high protein content foods (meat, fish, eggs, cheese, dried legumes)	
	☐ high fat content foods (sausages, focacce, fried potatoes, cakes with butter and cream)	
	☐ high carbohydrate content foods (bread, pasta, rice, potatoes, biscuits)	
	☐ different foods every day	
C10.	Your snacks are based mainly on:	
	☐ fruit/fruit juice/fruit and milk shakes/yogurt	
	☐ biscuits/crackers/bread/stick bread	
	☐ fried potatoes/pop corn/krapfen/peanuts/soft drinks	
	☐ sweets/chocolate/ice cream/cakes	
C11.	Which beverages do you usually drink between meals?	
	☐ mineral water	
	☐ soft drinks (cola, orange, soda, iced tea, tonic water, etc.)	
	☐ fruit/fruit juice/fruit and milk shakes	
C12.	Do you drink at least one glass of milk or do you eat at least one cup of yogurt every day?	☐ always
		☐ often
		☐ sometimes
		☐ never
C13.	Do you drink at least 1–1.5 l of mineral water every day?	☐ always
		☐ often
		☐ sometimes
		☐ never

BACK TO ARTICLE

10.8.3. Table A3. Physical activity and Lifestyle

D1.	Do you usually practice a physical activity?	☐ always during the entire year

		☐ only in some seasons
		☐ sometimes
		☐ never
D2.	How many hours do you practice it?	☐ 1–2 h in a week
		☐ 3–4 h in a week
		☐ more than 4 h in a week
		☐ no hour
D3.	What do you prefer to do during free time?	☐ walking
		☐ watching TV/listening to music/using the computer/reading a book
		☐ practicing a sport
		☐ shopping
D4.	How many hours do you spend on the computer or watching TV?	☐ 1–2 h a day
		☐ 3–4 h a day
		☐ 5–6 h a day
		☐ more than 6 h a day
D5.	The physical activity that you practice at school:	☐ are tiring
		☐ are boring
		☐ stimulates you to practice sports even out of school
		☐ make you feel well
D6.	Your lifestyle is:	☐ very sedentary
		☐ sedentary
		☐ moderately active
		☐ very active

10.8.4. Table A4. Healthy and Unhealthy dietary habits and food

E1.	According to you, which is a healthy diet?
	☐ a diet rich in different foods
	☐ foods rich in protein (meat, fish, eggs, cheese, dried legumes)
	☐ a diet without any fats
	☐ eating fish very often
E2.	According to you, which is the healthiest eating behaviour?
	☐ drinking two glasses of milk/eating two cups of yogurt every day
	☐ preferring cooked vegetables to uncooked vegetables
	☐ eating always cheese instead of meat
	☐ when you eat snacks, preferring fruit/fruit juice/biscuits and crackers
E3.	According to you, which is a healthy food?
	☐ a food rich in protein
	☐ a food rich in calories
	☐ a microbiologically tested food
	☐ a food without preservatives and additives
E4.	According to you, which is the healthiest food?
	☐ washed vegetables ready to eat
	☐ a canned food
	☐ a food very rich in dressing
	☐ a fried food
E5.	According to you, which is the healthiest cooking method?
	☐ cooking on a grill/in boiled water
	☐ frying/braising
	☐ cooking in the oven without fats
	☐ cooking in a pan with fats

10.8.5. Table A5. Self-efficacy

F1.	Do you think you are able to choose anything by yourself?	☐ yes
		☐ no
		☐ I don't know
F2.	Do you think you are able to use advice aimed at improving your well-being?	☐ yes
		☐ no
		☐ I don't know
F3.	Do you think you are able to modify your diet if needed?	☐ yes
		☐ no
		☐ I don't know
F4.	Do you think you are able to loose or to gain weight if needed?	☐ yes
		☐ no
		☐ I don't know
F5.	Do you think you are able to use nutrition advice aimed at improving your dietary habits?	☐ yes
		☐ no
		☐ I don't know
F6.	Do you think you are able to use nutrition advice aimed at improving your health status?	☐ yes
		☐ no
		☐ I don't know
F7.	Do you think you are able to practice a constant physical activity in order to improve your well-being?	☐ yes
		☐ no
		☐ I don't know
F8.	Do you think you are able to practice a constant physical activity in order to improve your physical aspect?	☐ yes
		☐ no

10.8.6. Table 6. Barriers to change

G1.	Do you have some influence on cooking food at home?	☐ yes

		☐ no
G2.	Do you know which foods must be restricted to reduce dietary intake of fats and cholesterol?	☐ yes
		☐ no
G3.	Do you know which foods must be restricted to reduce dietary intake of sugar?	☐ yes
		☐ no
G4.	Do you know which foods must be eaten to increase dietary intake of fibre?	☐ yes
		☐ no
G5.	Do you know which benefits you could gain by eating a healthy diet?	☐ yes
		☐ no
G6.	Do you know how to improve your diet?	☐ yes
		☐ no
G7.	Do you know how much you must eat to satisfy your energy requirement?	☐ yes
		☐ no
G8.	Do you know how important it is not to be influenced by your friends in choosing your food?	☐ yes
		☐ no
G9.	Do you think that your family would support your efforts in improving your food habits?	☐ yes
		☐ no

10.8.7. Table A7. Nutrition knowledge

H1.	Which different foods contain carbohydrates?	☐ meat
		☐ butter
		☐ bread
		☐ cheese
H2.	Which different foods do not contain dietary fibre?	☐ wholemeal bread
		☐ beans
		☐ white bread
		☐ meat
H3.	Which different foods are less rich in fat?	☐ hamburger with mayonnaise
		☐ grilled meat
		☐ focaccia
		☐ sandwich with salami
H4.	Which different foods are richer in protein?	☐ dry legumes
		☐ dover sole
		☐ spaghetti with tomato sauce
		☐ apple
H5.	Which different foods are richer in calories?	☐ bread
		☐ potatoes
		☐ fruit salad
		☐ tiramisú
H6.	Which different substances contain more energy?	☐ protein
		☐ carbohydrates
H7.	What are the functions of vitamins and minerals?	☐ fat
	☐ to put on muscular tissue	

	☐ to lose body fat	
	☐ to catalyse biochemical reactions in the body	
	☐ to provide energy	
H8.	According to you, what is 'a balanced diet'?	
	☐ a diet rich in protein	
	☐ a diet poor in fat	
	☐ a diet without carbohydrates	
	☐ a diet containing all nutrients in proper quantities	
H9.	According to you, what is 'daily energy expenditure'?	
	☐ energy consumed in the whole day	
	☐ energy consumed during sleep	
	☐ energy consumed only for physical activity	
	☐ energy consumed for maintaining body temperature at 37°C	
H10.	What are 'biological foods'?	
	☐ foods grown without any use of chemical fertilizer	
	☐ foods grown in greenhouse	
	☐ foods without additive and preservatives	
	☐ foods grown in a ground far from the highway	
H11.	What are 'transgenic foods'?	
	☐ foods imported from foreign countries	
	☐ foods in which different fragments of DNA have been included	
	☐ foods without potentially pathogenus germs	
	☐ foods without toxic substances	

10.8.8. Table A8. Knowledge on food safety

I.1.	A food intoxication is:	
	☐ an infection caused by lack of vitamins	

	☐ a disease caused by the consumption of foods contaminated by pathogenic germs	
	☐ a disease caused by an excessive consumption of food	
	☐ a disease caused by assumption of a chemical toxin	
I.2.	Which of the following are caused by food intoxication?	
	☐ vomit, diarrhoea, fever	
	☐ only vomit and diarrhea	
	☐ it depends on the type of causative germ	
	☐ fever, sore throat and cough	
I.3.	Which of the following are most responsible for food intoxication?	
	☐ inadequate preservation	
	☐ contamination of food prior to cooking	
	☐ manipulation of cooked food immediately prior to consumption	
	☐ inadequate washing of plates and silver ware	
I.4.	Which of the following foods are mostly implicated in the onset of food intoxication?	☐ eggs and cream
		☐ vegetables
		☐ frozen meat
		☐ biscuits
I.5.	Which of the following behaviours can cause cross-contamination of foods?	
	☐ use of the same utensils for cooked and raw foods	
	☐ washing one's hands after having handling raw foods and before handling cooked foods	
	☐ using different surfaces for cooked and raw foods	
	☐ keeping cooked and raw foods separated	
I.6.	How can you transmit Salmonella?	
	☐ by coughing on the food	
	☐ by touching foods without having washed one's hands	
	☐ by sneezing on the food	

	☐ by smoking while preparing the food	
I.7.	Which is the optimum temperature for bacterial growth?	
	☐ from 0°C to +4°C	
	☐ from +4°C to +60°C	
	☐ beyond 60°C	
	☐ under -5°C	
I.8.	Do cold temperatures kill pathogenic germs which may be present in foods?	
	☐ rarely	
	☐ no, on the contrary it facilitates growth	
	☐ no, it inhibits growth	
	☐ yes, always	
I.9.	Does heat kill germs?	☐ yes, always
		☐ no, never
		☐ yes, above 40°C
		☐ yes, above 60°C
I.10.	Which of the following diseases can be transmitted by ingestion of contaminated foods?	☐ hepatitis A
		☐ AIDS
		☐ pneumonia
		☐ the flu

10.8.9. Table A9. Food safety and behavior in hygiene practices

J.1.	When you buy packaged food, do you check the expiry date?	☐ always
		☐ often
		☐ sometimes
		☐ never
J.2.	Do you read the instruction for use and for preservation written on the packaged foods?	☐ always
		☐ often
		☐ sometimes
		☐ never
J.3.	Do you wash your hands before eating and before touching foods?	☐ always
		☐ often
		☐ sometimes
		☐ never
J.4.	Do you usually wash fruit that must not be peeled before eating it?	☐ always
		☐ often
		☐ sometimes
		☐ never
J.5.	After drinking a glass of milk, do you usually put the milk in the fridge?	☐ always
		☐ often
		☐ sometimes
		☐ never
J.6.	If you realize you have left the milk out of the fridge during the night, what do you do?	☐ you throw it away
		☐ you tell your mother to throw it away
		☐ you put it in the fridge again
		☐ you drink it
J.7.	If the butcher touches ham with his hands, do you eat it?	☐ always
		☐ often
		☐ sometimes ☐ never

10.9. Appendix 9

образац изјаве о ауторству

Изјава о ауторству

Име и презиме аутора: Fadi Fayad

Број индекса: 5011/2018

Изјављујем да је докторска дисертација под насловом:

“Physical Activity Profile, Eating Habits, and Body Composition Status in Lebanese University Students: Comparative Study”

• резултат сопственог истраживачког рада;

• да дисертација у целини ни у деловима није била предложена за стицање друге дипломе према студијским програмима других високошколских установа;

• да су резултати коректно наведени и

• да нисам кршио/ла ауторска права и користио/ла интелектуалну својину других лица.

Потпис аутора

У Београду, 12.05.2022 _____

образац изјаве о истоветности штампане и електронске верзије докторског рада

Изјава о истоветности штампане и електронске верзије докторског рада

Име и презиме аутора: **Fadi Fayad**

Број индекса: **5011/2018**

Студијски програм: **Experimental methods of human locomotion research**

Наслов рада: **Physical Activity Profile, Eating Habits, and Body Composition Status in Lebanese University Students: Comparative Study**

Ментор: **Dr. Milivoj Dopsaj, Full professor, University of Belgrade, Faculty of Sport and Physical Education.**

Изјављујем да је штампана верзија мог докторског рада истоветна електронској верзији коју сам предао/ла ради похрањивања у **Дигиталном репозиторијуму Универзитета у Београду**.

Дозвољавам да се објаве моји лични подаци везани за добијање академског назива доктора наука, као што су име и презиме, година и место рођења и датум одбране рада.

Ови лични подаци могу се објавити на мрежним страницама дигиталне библиотеке, у електронском каталогу и у публикацијама Универзитета у Београду.

Потпис аутора

У Београду, 12.05.2022 _____

образац изјаве о коришћењу

Изјава о коришћењу

Овлашћујем Универзитетску библиотеку „Светозар Марковић“ да у Дигитални репозиторијум Универзитета у Београду унесе моју докторску дисертацију под насловом:

која је моје ауторско дело.

Дисертацију са свим прилозима предао/ла сам у електронском формату погодном за трајно архивирање.

Моју докторску дисертацију похрањену у Дигиталном репозиторијуму Универзитета у Београду и доступну у отвореном приступу могу да користе сви који поштују одредбе садржане у одабраном типу лиценце Креативне заједнице (Creative Commons) за коју сам се одлучио/ла.

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Потпис аутора

У Београду, 12.05.2022 _____

11. BIOGRAPHY OF THE AUTHOR

Fadi Fayad was born on September 9th 1977 in Beirut, Lebanon's capital. He completed Bachelor studies at the Lebanese University, Faculty of Education, Department of Physical Education and Sport and graduated in 2001, where he also completed his Master studies in 2017. He enrolled in the Doctoral academic studies at the University of Belgrade, Faculty of sport and physical education in 2018. Currently, Fadi is employed as a lecturer and trainer in the Lebanese University, Faculty of Education, Department of Physical Education and Sport. His academic achievements are publishing two scientific articles as first author, and another two articles as co-author in international journals in the fields of human movement, health and lifestyle behavior.

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