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Analysis of the Correlation between Physical Activity Levels and Health-Related Components in Different Age Groups

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Özet
The aim of this study is to determine the physical activity levels of different age groups, to analyze the correlation between certain parameters related to health and the demographics of individuals and to evaluate their comparisons. Total number of 1043 voluntary participants, 368 males and 675 females, between 45 and 75 who are not confined to bed and cognitive functions of whom are sufficient were included in the current study. To collect data, Internation Physical Activity Questionnaires Short Form was used. In the analysis of the data, SPSS 22 package program was used. The Physical Activity Scores (MET) and the frequency distribution of demographics were determined by descriptive analysis whereas in order to analyze the IPAQ total scores and the correlation between health-related parameters and demographics, crosstab was applied (Sweet and Grace-Martin, 2003). The significance level was accepted as 0,05 in the analysis of data. According to the analysis results, in terms of "age", "gender" and "marital status", significant differences were revealed in BMI, MET, chronic disease state and abdominal obesity states whereas in terms of MET levels, significant differences occurred in BMI, abdominal obesity and chronic disease state. Considering age variable, it was found that while 45-49 age group had normal weight (N=203), 70-75 age group had overweight (N=198); 45-49 age group had sufficient level of physical exercise and no abdominal obesity in their MET and abdominal obesity values (N=186) whereas 65-69 age group had low physical activity levels (N=132) and 70-75 age group had abdominal obesity (N=155). When MET levels are considered, the participants with sufficient level of physical activity consisted of participants with normal weight whereas the participants with low level of physical activity consisted of overweight and obese participants. According to the study results, while physical activity levels decrease with age, an increase in weight and abdominal circumference was observed; accordingly, the frequency of chronic diseases also increases. Therefore, it can be stated that Physical Activity has an impact on the protection of general health state and healthy aging.

Anahtar kelimeler: Physical activity, MET, BMI, Healthy aging

INTRODUCTION

The world population is continuously aging due to the demographic changes (Thomas et.al., 2019). Like every living creature, humans have an average life cycle depending on their genetics and environmental conditions (Galip, 2017). Aging is a natural process and every living creature will go through the process. There are certain physical situations brought by aging. Aging is accompanied by the physical fitness of the individuals and the decrease in their endurance during physical activity (Günaydın, 2018). Therefore, the concept of aging healthily has been gaining more and more importance today. An important correlation between aging healthily and physical activity has been found (Demirtaş et.al., 2017).

Physical activity has an important effect on the health. Some effects have become more settled. Physical activity which is one of the significant components of energy expenditure has a great effect on energy balance and body composition. It is also accepted that physical activity is an alterable risk factor which has a protective effect on cardiovascular diseases, stroke, type 2 diabetes, colon and breast cancer and which is related to other significant health outcomes such as mental health as well (Allender et.al., 2007; Langhammer et.al., 2018; Muralidharan et al., 2018).

The physiological effects of physical activity have a wide range and affect various systems in the body. As an alterable component of energy expenditure, physical activity can affect energy balance. Furthermore, the total effect of physical activity on total energy expenditure extends beyond the physical-activity-based energy expenditure. Increases in resting metabolic rate and non-exercise related activity thermogenesis can be observed. Moreover, physical activity decreases the fat mass and increases fat-free mass resulting in positive effects in body composition (Miles, 2007).

Regular physical activity is accepted as a common behavior to decrease mortality rates and to improve a number of health outcomes. Physical activity in adolescence contributes to development of a healthy adult life and can help with reducing the chronic disease incidence (Hallal et.al., 2006; Luzak et al., 2017). Published by USDHHS, Physical Activity Guidelines for American (PAGA) decisively provides physical activity recommendations for public health (PAGA, 2008). Also, it is a well-known fact that doing physical activities as a habit has a role in protecting individuals from heart diseases (Chrysohoou et.al., 2017).

Practice of physical activity (PA) is a significant health-related variable even though it is hard to measure (Laporte et.al., 1985). Individuals with higher levels of physical activities has lower level of coronary heart disease, type 2 diabetes mellitus, hypertension, certain cancer types and osteoporosis incidence rates. On the other hand, inactive individuals have a higher possibility of mortality when compared to active individuals (Bauman, 2004). In addition to the protective effect of PA, it is recommended in the treatment of many diseases (Warst et.al., 2004; Bae et al., 2017). It is recommended for adults and elderly to do a mixed (aerobic and strength) and medium intensity exercise at least 75 to 150 minutes a week (Harris et al., 2018; Lian et al., 2016; López-Sánchez et al., 2020). However, the results in the literature shows that the level of physical activity decreases with age (Larsson et al., 2016). Previous research indicated that weekly physical activity level as well as wellness and mental health can decrease with age (Poláčková & Halmová, 2016). However, there are studies providing

suggestions about how to increase the level of physical activity in the literature by informing the elderly about the benefits of physical activity and reducing risks and by improving environmental and financial situations so that the elderly can also participate (Franco et.al., 2015). Therefore, the elderly should be encouraged and supported in terms of physical activity participation (Jardim & Nascimento, 2015). Also, it is a fact that integrating daily routines to structured fitness/physical activity programs can improve the quality of life (Catela et.al., 2017).

Today almost all of the work that requires power are carried out by machines, and the people of 21st century have become individuals who do not use their muscles except for obligatory situations; thus, they do not consume much energy except for their basal metabolism (Korkmaz & Topal, 2006). Both inactive lifestyle and technological innovations have led a certain observable increase in obesity prevalence in many countries worldwide. Obesity is defined as "abnormal or excessive fat accumulation in the body which can deteriorate health" (Karakoç et.al., 2013). The difference between abdominal obesity and overall obesity is that abdominal does not only express the excessive weight. While some of the calories taken during the day are consumed in basal metabolism, another part of it are consumed during physical exercise. If the amount of physical exercise is reduced, the remaining energy is stored in the body as adipose tissue; therefore, abdominal obesity can emerge in come individuals although their weight is normal (Oğuz, 2008). Even in the situations where BMI is normal, abdominal obesity is a risk factor for cardiovascular diseases and an independent determiner in terms of morbidity (Aladağ, 2004).

Due to its adverse cardiometabolic effects, abdominal obesity is a significant health problem. Therefore, it is important in terms of public health to assess abdominal obesity along with overall obesity, to have an early diagnosis, to know the individual factors and to prevent potential diseases. In preventing the abdominal obesity and related health issues, health professionals play an important role in infusing healthy lifestyle behaviors in public and controlling preventable risk factors (Karakoç et.al., 2013).

In the light of given information, the current study aims to determine the physical activity levels in different age groups and evaluate the comparison between the relationship of health-related parameters and demographics.

METHOD

Research Method

The aim of this study is to determine the physical activity levels of different age groups, to analyze the correlation between certain parameters related to health and the demographics of individuals and to evaluate their comparisons. In the current study, survey method which enables to determine features such as views, skills, interests, or attitudes of the sample group (Büyüköztürk et.al., 2014) was used.

Study Group

In the current study, total number of 1043 voluntary participants, 368 males and 675 females, between 45 (N=203, 19,5%) and 75 (N=189, 18,1%) who are not confined to bed and cognitive functions of whom are sufficient were included in the current study.

Data Collection

International Physical Activity Questionnaires (IPAQ)

International Physical Activity Questionnaires Short Form was developed in order to determine the physical activity levels of individuals (IPAQ Research Committee, 2005). The calculations of questionnaire (short form) scores is based on the calculation of MET (metabolic equivalent) values by evaluating the minimum 10-minute physical activities done in the last seven days in terms of frequency, duration (minutes) and intensity. 1 MET show the consumed oxygen amount of an individual in resting (3.5m 1 0 2 / kg/min) (Keleş & Boduroğlu, 2007). By multiplying of minute, day and MET values, a score is obtained as "MET-min/week". The classifications are as follows: not physically active (<600 MET-min/week), low physical activity (600-3000 MET-min/week) and sufficient physical activity (which is beneficial in terms of health) (>3000 MET-min/week) (Cengiz et.al., 2009).

BMI

BMI is a weight-height ratio which is valid and commonly used in order to classify the weight status and obesity in adults without making a distinction between men and women. Body Mass Index is calculated by dividing the weight (kg) to height square (m) (BMI=kg/m^2). The obtained BMI values of the participants were classified according to the table below.

BMI (kg/m^2)	**Classification**
<18,5	Underweight
18.5-24.9	Normal range
25.0-29.9	Overweight
≥30	Obese

Abdominal Obesity

The limit value of abdominal obesity is reported as ≥80cm for women and ≥94cm for men in 2005 Guidelines of International Diabetes Federation (Alberti et.al., 2009). The abdominal measurements of the participants were classified as follows: for women under 80 cm and men under 94 cm "No increase in abdomen" and for women over 80 cm and men over 94 cm "Increase in abdomen" expressions were used.

Data Analysis

In the analysis of the data, SPSS 22 package program was used. The Physical Activity Scores (MET) and the frequency distribution of demographics were determined by descriptive analysis whereas in order to analyze the IPAQ total scores and the correlation between health-related parameters and demographics, crosstab was applied (Sweet and Grace-Martin, 2003). The significance level was accepted as 0,05 in the analysis of data.

FINDINGS

Table 1. Descriptive analysis results of participants' demographics

		N	%
AGE	**45-49**	203	19,5
	50-54	172	16,5
	55-59	167	16
	60-64	146	14
	65-69	166	15,9
	70-75	189	18,1
GENDER	**Female**	675	64,7
	Male	368	35,3
MARITAL STATUS	**Married**	564	54,1
	Single	83	8
	Widow	369	38
BMI	**Normal**	203	19,5
	Overweight	172	16,5
	Obese	167	16
IPAQ	**Inactive**	97	9,3
	Low Level of Physical Activity	600	57,5
	Sufficient Level of Physical Activity	346	33,2
CHRONIC DISEASE	**Yes**	587	56,3
	No	456	43,7
ABDOMINAL OBESITY	**Increase in Abdomen**	507	48,6
	No Increase in Abdomen	536	51,4

In Table 1, the descriptive statistics analysis results of the participants are presented. It is seen that the majority of the sample consists of 45-49 age group (N=203, 19,5%) and female (N=675, 64,7%) participants. When the marital status of the participants is considered, it is obvious that the number of married participants (N=564, 54,1%) is higher than single and widow participants. A major part of the participants has normal weight (N=203, 19,5%) and a low level of physical activity (N= 600, 57,3%); also, the majority of the participants has chronic diseases (N=587, 56,3%) and no significant increase in abdomen (N=536, 51,4%).

Table 2. Comparison of different features of the participants in terms of age variable

		AGE					
		45-49	**50-54**	**55-59**	**60-64**	**65-69**	**70-75**
BMI	**Normal**	203	142	0	0	0	0
	Overweight	0	30	167	146	162	0
	Obese	0	0	0	0	4	198
$X^2(10)= 1930.81$, p=.000							
IPAQ	**Inactive**	0	0	9	17	12	59
	Low Level of PA	40	86	118	96	132	126
	Sufficient Level of PA	163	86	40	31	22	4
$X^2(10)= 449.001$, p=.000							
ABDOMINAL OBESITY	**Increase in Abdomen**	17	72	88	81	94	155
	No Increase in Abdomen	186	100	79	65	72	34
$X^2(5)=227.242$, p=.000							
CHRONIC DISEASE	**Yes**	102	87	94	78	105	121
	No	101	85	73	68	61	68
$X^2(5)= 13.641$, p=.000							

In Table 2, the distributions for different parameters and chi-square results of the participants according to age variable are presented. Considering findings, it can be said that there are

significant differences in the BMI, IPAQ, Chronic disease and abdominal obesity variables ($p<0.05$). While the participants of 45-49 and 50-54 age groups have significantly normal BMIs, 55-59, 60-64 and 65-69 age groups participants are overweight, and 70-75 age group participants are obese. When the IPAQ values are considered, the majority of the participants who are in active or has a low level of physical activity is in 60-64, 65-69 and 70-75 age groups. Furthermore, the majority of the participants in 45-49 and 50-54 age groups has sufficient level of physical activity. Almost in all age groups, the number of participants with a chronic disease is higher than the ones without a chronic disease. However, the number of participants with a chronic disease is rather higher than the ones without a chronic disease in 65-69 and 70-75 age groups. While no increase in abdomen was observed in 45-49 and 50-54 age group participants, the majority of 65-69 and 70-75 age groups has increase in abdomen.

Table 3. Comparison of different features of the participants in terms of gender variable

		GENDER	
		Female	**Male**
BMI	**Normal**	338	7
	Overweight	259	246
	Obese	78	115
$X^2(2)= 256.889$, p=.000			
IPAQ	**Inactive**	41	56
	Low Level of PA	348	252
	Sufficient Level of PA	286	60
$X^2(2)= 82.043$, p=.000			
ABDOMINAL OBESITY	**Increase in Abdomen**	290	217
	No Increase in Abdomen	385	151
$X^2(1)= 24.420$, p=.000			
CHRONIC DISEASE	**Yes**	363	224
	No	312	144
$X^2(1)= 4.868$, p=.000			

In Table 3, the distributions for different parameters and chi-square results of the participants according to gender variable are presented. In terms of the genders of the participants, BMI, IPAQ, Chronic disease, abdominal obesity and medication use variables had significant differences ($p<0.05$). The majority of the females were found normal and overweight whereas the majority of males were observed overweight and obese. Moreover, it is seen in the light of the analyzed data that females have a more sufficient level of physical activity parameter than males. It is determined that the number of female participants with chronic disease is higher than the number of male participants with chronic disease. Also, whereas the increase in abdomen was observed in a lesser level in females, the increase in abdomen in males were higher.

Table 4. Comparison of different features of the participants in terms of marital status variable

		MARITAL STATUS		
		Married	**Single**	**Widow**
BMI	**Normal**	257	6	82
	Overweight	253	33	219
	Obese	54	44	95
X^2 (4)= 152.479, p=.000				
IPAQ	**Inactive**	34	18	45
	Low Level of PA	273	59	268
	Sufficient Level of PA	257	6	83
X^2 (4)= 100.666, p=.000				
ABDOMINAL OBESITY	**Increase in Abdomen**	211	59	237
	No Increase in Abdomen	353	24	159
X^2 (2)= 65.118, p=.000				
CHRONIC DISEASE	**Yes**	282	44	261
	No	282	39	135
X^2 (2)= 24.322, p=.000				

In Table 4, the distributions for different parameters and chi-square results of the participants according to marital status variable are presented. The findings show that there are significant differences in BMI, IPAQ, Abdominal obesity and Chronic disease variables of the participants in terms of marital status ($p<0.05$). It was seen that the majority of the married participants has normal weight or is overweight whereas the majority of single participants is overweight or obese. Furthermore, the participants who reported that they are widowed are overweight to a large extend. It is determined in the analysis that married participants have a more sufficient level of physical activity compared to single and widow participants. When chronic disease variable is compared in terms of marital status, no difference was found among married individuals whereas the number of participants with chronic diseases is higher than the ones without chronic diseases in single and widow individuals. Moreover, while abdominal circumference increase was not observed in married participants, abdominal increases were observed in single and widow participants.

Table 5. **Comparison of different features of the participants in terms of IPAQ levels**

		IPAQ		
		Inactive	**Low Level of PA**	**Sufficient Level of PA**
BMI	**Normal**	0	102	243
	Overweight	36	370	99
	Obese	61	128	4
X^2 (4)= 437.834, p=.000				
ABDOMINAL OBESITY	**Increase in Abdomen**	97	408	2
	No Increase in Abdomen	0	192	344
X^2 (2)= 512.396, p=.000				
CHRONIC DISEASE	**Yes**	53	360	174
	No	44	240	172
X^2 (2)= 8.528, p=.014				

In Table 5, the distributions for different parameters and chi-square results of the participants according to IPAQ levels variable are presented. In terms of IPAQ levels of the participants, it was revealed that there are significant differences in BMI, Abdominal obesity and Chronic

disease variable ($p<0.05$). According to IPAQ levels, it was observed that the participants with sufficient level of physical activity are overweight whereas the participants with low level of physical activity are overweight and obese. Moreover, the participants who have inactive IPAQ scores are generally overweight. The analysis revealed that the participants with low level of physical activity have a significant increase in their abdomen compared to inactive sufficiently active participants. When chronic disease variable is compared in terms of IPAQ levels, no significant difference was observed between inactive participants and the participants with sufficient level of physical activity while the number of participants with chronic diseases is higher in the group of low level of physical activity.

Table 6. Comparison of different features of the participants in terms of BMI levels

		BMI		
		Normal	**Overweight**	**Obese**
ABDOMINAL OBESITY	**Increase in Abdomen**	76	272	159
	No Increase in Abdomen	269	233	34
$X^2(2)= 191.280$, $p=.000$				
CHRONIC DISEASE	**Yes**	173	291	123
	No	172	214	70
$X^2(2)= 10.002$, $p=.007$				

In Table 6, the distributions for different parameters and chi-square results of the participants according to BMI levels are presented. In terms of BMI levels, it can be said that significant differences were found in Abdominal obesity and Chronic disease ($p<0.05$). According to BMI categorization, it was seen that overweight and obese individuals have a higher level of increase in abdomen compared to normal weight participants. Furthermore, it can be said from the analysis result that Chronic disease is higher in normal and overweight participants compared to obese participants.

DISCUSSION

When the findings obtained from the analysis of the current study are evaluated, it is seen that significant differences were found in BMI, IPAQ, Chronic disease and Abdominal obesity values in certain age groups. Accordingly, it is seen that the participants of 45-49 and 50-54 age groups are in the normal weight category. The fact that these groups are still in the work force; therefore, they are in a more active life is thought to cause their BMIs to remain in normal values. Also, it is revealed that the participants of 55-59, 60-64 and 65-69 age groups are in overweight category, and 70-75 age group participants are majorly obese. When the literature is reviewed, it was determined in the study of Chang et.al. (2016) on the American sample that the senior adults have a higher BMI when compared to young adults and they tend to become obese more than young adults. When being physically active states of the participants are considered in terms of age variable, it is determined that the participants of 60-64, 65-69 and 70-75 age groups are generally inactive or have a low level of physical activity. Similar to the findings of the current study, Gray et.al. (2018) reported in the qualitative study on participants of 50 or higher years of age that as the participants' ages increase, they ignore having an active lifestyle; that is, their physical activity levels start to decrease since they consider becoming tired more. Sarcopenia which is defined as the loss of

muscle mass and strength loss is common in the elderly who are not physically active (Curcio et.al., 2019). Thus, physical exercise and general wellness can be potential non-pharmacologic methods that are beneficial in preventing mortality in elderly individuals (Park et.al., 2017). With a physical activity program which is solely prepared for an individual, positive effects occur not only in terms of physical and physiological parameters but also in terms of depressive symptoms and quality of life parameters (Lok et.al., 2017). In the study where Khatami (2017) analyzed the theories on aging and chronic diseases, it is reported that the combination of inner/genetic factors which affect the physiological behaviors of organs and tissues and external factors such as lifestyle and environmental parameters or being exposed to chemicals will have great effects on the aging process and will increase the chronical diseases that can emerge with aging. Finally, when abdominal obesity is considered in terms of age variable, it is determined that the participants of 65-69 and 70-75 age groups have an increase in abdominal obesity values when compared to 45-49 and 50-54 age groups. When the aforementioned situations are considered, the fact that BMI increases with age, the level of physical activity decreases, and certain constraints brought by chronic diseases are experienced can cause the increase in abdominal obesity in the elderly population. Miles (2007) reported that there are significant evidences that physical activity is, both independently and through its effect on weight gain and obesity, a protective intervention for a number of chronic diseases. It is also emphasized that more physical activity is related to less weight gain, and weight loss programs that include regular physical activity is more effective in terms of sustaining weight loss.

The analysis results for gender variable revealed significant differences in terms of BMI, IPAQ, chronic disease states and abdominal obesity. When the findings in which BMI values of participants are compared are considered in terms of gender, it is determined that females are generally in normal and overweight categories whereas males are in overweight and obese categories generally. Also, the female participants are more physically active when compared to male participants whereas male participants have greater increases in terms of abdominal obesity. When the literature is reviewed, there are results contrary to the current study. Papadopoulou et.al. (2020) concluded in their study on Greek population that when compared to men, women have twice the risk of abdominal obesity, and fat mass index and fat-free mass index are closely related to BMI. When considered in terms of physical activity levels of an elderly population, Ramires et.al (2017) found out that the elderly population in Brazil generally has a low level of physical activity, that women do low intensity physical activities while men do medium level physical activities, yet in a general sense the elderly does not show a significant different in terms of physical activity when gender is considered.

When marital status is considered, significant differences are found in the BMI, IPAQ, abdominal obesity and chronic disease levels of the participants. In terms of BMI, married participants are in normal and overweight category whereas single participants are in overweight and obese category. On the other hand, widow participants are in overweight category. Paralleled with these findings, it is observed that married participants are sufficiently active and single and widow participants are physically inactive. Also, it is revealed that single and widow participants reports more chronic disease, and in terms of abdominal obesity, the increase of married participants' values is lower while single and

widow participants' abdominal obesity increase is much higher. When the literature is reviewed, Lee et.al (2020) reported in their study on 40-69 age group individuals that the highest BMI group is married/cohabitant men whereas widow women have the highest BMI. On the other hand, it is also reported that single participants' BMIs are lower than normal values. Furthermore, Liao et.al. (2018) stated in their study on twins that married twins have a higher BMI than single twins. In addition, when compared to single twins, married twins have a higher tendency to become overweight. When marital status is reviewed in terms of chronic disease, Ramenzankhani et.al. (2019) analyzed the emergence of different chronic diseases in terms of marital status. They reported that single men have a significant risk factor in terms of hypertension, and when compared to married women, widow women display a lesser level of diabetes risk.

When the findings are considered in terms of having a physically active lifestyle, significant differences were found in the BMI, abdominal obesity and chronic disease states of the participants. It is determined that the participants who do a sufficient amount of physical activity have BMIs closer to the normal weight category when compared to low level physical activity group and inactive physical activity group. Similar to the finding of the current study, it is seen that low-level physical activity group participants show significant increases in terms of abdominal obesity. Moreover, the participants with lower level of physical activity was found to have more chronic diseases. When the literature is reviewed, there are studies that found no correlation between BMI and physical activity (Savcı et.al., 2006). However, in the weight control intervention programs in the literature, it is known that exercise in a certain intensity and repetition is used as a tool along with diet (Akkurt, 2012). When considered in terms of chronic diseases, there are studies revealing that the lipids covering liver and visceral organs reduce with exercise intervention in the individuals that are physically inactive (Johnson et.al., 2009) which shows that metabolic situations causing chronic diseases are affected.

It is seen that abdominal obesity and chronic disease values of the current study participants differ significantly in terms of BMI. When the literature is reviewed, in the study of Fan et.al. (2016) on individuals over 65 years of age, the overall overweight situation and abdominal obesity levels of the participants from the Shanghai Elderly Cardiovascular Health Studies is rather common, and especially abdominal obesity is related to chronic heart diseases.

In the recent years, not only in the world but also in Turkey the number of elderly population has increased; therefore, studies on physical and psychological changes that occur with aging have gained an acceleration (Vagetti et.al., 2020; Park et.al., 2017; Dipietro et.al., 2019; Asp et.al., 2017; Taheri & Irandoust, 2017).

Old age period which is defined as the period of losses due to its distinctive problems; therefore, it can also be defined as the period in which self-esteem and life satisfaction of the elderly starts to reduce (Yerli, 2017). There are irregularities and deteriorations emerging in cells, tissues, organs and systems with aging which explains the biological aging. In this process, functional insufficiencies in body composition, cardiovascular system, kidneys, digestive system, liver, brain, neurons, lungs and endocrine system can emerge (Mercanlıgil, 2019). All these problems cause adverse effects on the quality of life of the elderly population

(TEMD, 2019). As a result of the current study which aimed to determine the physical activity levels of different age groups in order to analyze the correlation between certain health-related parameters and demographics of the participants, it is concluded that there are increases in various health problems, and this increases are accelerated by inactive lifestyle and correspondingly emerging weight problems.

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