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Predictors Analysis of Physical Activity Participation among Young Adults

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Background/Objectives: The objective of this paper was to analyse the predictors and level of physical activity (PA) participation according to demographics and health-related characteristics of young adults residing in Jeju, Korea. **Methods/Statistical analysis:** We used the Global Physical Activity Questionnaire, the World Health Organization Quality of Life-BREF (WHOQL-BREF) and the statistical package for the social sciences (SPSS) statistical program and examined demographic characteristics (gender, age, occupation, economic level, etc.). **Findings:** First, the level of PA participation was higher in males than in females, and the higher the economic status, subjective quality of life, physical factors, psychological factors, and environmental factors, the higher the rate of PA. Second, the predictors of medium-intensity activity were found to differ according to the level of physical factors. Third, the predictors of high-intensity activity differed according to gender and environmental factors. Fourth, the predictors of regular PA (600METs) were found to differ according to the economic condition, subjective quality of life, physical and environmental factors. Fifth, the predictors of health promotion physical activity (3,000 METs) differed according to gender, age, and subjective health status. **Improvements/Applications:** Therefore, it is necessary to establish a concrete strategy to improve the participation and accessibility of young adults according to PA-friendly environment and social and physical support.

Key words: *Young Adult, Health, Physical activity, GPAQ, METs.*

Introduction

How do young people perceive health? Having accurate perceptions of health can affect the future health of individuals and influence the formation of lifestyles. It is significant to understand the impact on perceived risks associated with healthcare and health. Young adults can fully develop a variety of diseases. For example, a recent study found an effect in hospitalisation rates of acute ischemic stroke on youth who coexisted with an increased prevalence of traditional stroke risk factors (George et al. 2017). In addition, young adults (ages 18-45) are becoming increasingly unhealthy risk factors including obesity and lack of physical activity (PA) over the past 20 years, and over the past decades, the tendency of cardiovascular disease in young adults has been steadily or slightly increased (especially heart failure) (Andersson and Vasan, 2018).

Today, PA is recognised as a promising behaviour that can improve health through changing habit, the benefits of regular PA have been identified through numerous studies, and the evidence level behind it is very high. Many studies have shown that PA has a preventive effect on various health problems, and in addition, regardless of race, gender, age, and presence of disease, it contributes significantly to health promotion (Kyu et al. 2013). Nevertheless, there is not enough regular and adequate PA. Carmaina G. Valle et al. reported many young adults as a group are inactive in regards to PA for health, and 62% of the total failed to meet PA recommendations and PA lowest rate among the eight sub-groups was in the 31% -90% range in young adults (ages 18-39) (Valle et al. 2015). In addition, South Korean adults participate in insufficient PAs because 66.0% of 5,820 Korean adults do not comply with the guidelines (An, 2019). It is important to identify factors related to increased participation of recommended PA levels. Many studies have recognised that demographics and health-related characteristics of human beings have a significant role in PA (Notthoff et al. 2017; Wu et al. 2017). For example, Trost SG et al. confirmed that various factors, such as obesity, smoking, lack of time, past motor behaviour and the effects of 8 environmental variables, related to physical activity, and suggest that it is essential to better comprehend the environmental impact and the factors that affect various types of PA (Trost et al. 2002). There are also various health-related factors that can influence PA. Wu XY et al. found that high levels of PA are related to better quality of health-related life, when dose-response relationship among PA, sedentary behaviour, and quality of health-involved life have been studied (Wu et al. 2017). Further, increasing of PA associated with psychosocial factor, such as self-efficacy (Mama et al. 2015). It is important to understand the characteristics of the individual and the interaction of PA. Therefore, it is necessary to understand the relationship between demographic, health-related factors, and PA to obtain a more complete interpretation of the predictors of PA.

It is also worth noting that despite the continued study for PA, there is no end to the debate on how to promote PA. Looking at the related Korean studies, there is a problem in that consistent results are not shown even if similar variables are applied because random samples are selected for each study. One solution to this problem is representative sampling and the use of multidimensional approaches. However, it is a very meaningful process to find out the relationship between variables through repeated studies even if there are problems or limitations because not all research methods can be met.

This paper analyses the level of PA participation according to demographics and health-related characteristics of young adults (ages 19-34), and based on this, there is a purpose that extracts and identifies predictive factors for PA to provide basic data for developing health promotion strategies.

Materials and Methods

Subjects

This paper was approved by the Bioethics Review Board (JJNU-IRB-2019-025). The subjects were young people aged 19-34 who live on Jeju Island for more than 6 months. The survey was conducted from August to October, 2019. Recruitment sites of the subjects were selected from public institutions (libraries, community centres, etc.) and public facilities with large numbers of floating populations, and booths were attached to guide posts and surveys by requesting cooperation. We provided detailed explanations on the purpose and method of the study and the security of personal information to the subjects who voluntarily participated in this study, and after understanding all the study process, the subject completed the study participation agreement. A total of 504 subjects participated in the survey. Among them, a total of 479 (male: 243, female: 236) in the survey data were selected for analysis except for 25 insufficient response data. The sample size of this study was found to be satisfied by calculating the 263 subjects with 0.05 the a significance level, 0.30 effect size, 0.95 power, and 9 independent variables using the G-power 3.1 program.

Study Tools

Physical Activity

PA was examined utilizing the Global Physical Activity Questionnaire (GPAQ) to investigate the vigorous-intensity activity (VIA), moderate-intensity activity (MIA) and walking time conducted over the past seven days. The measured PA time was calculated as metabolic equivalent of task (METs / week), and METs were calculated as continuous variables with weights of vigorous-intensity 8.0 METs, medium-intensity 4.0 METs, and walking 3.3

METs. In the analysis, three categories of differences in PA participation (%) were classified into physically inactive (less than 600 METs), regular PA (more than 600 METs), and health-promoting PA (more than 3,000 METs). The predictor categories of medium- and vigorous-intensity activity were classified into the inactive group and PA group by intensity.

Demographics Characteristics

Demographic characteristics were examined by gender, age, occupation, and economic level.

Questionnaire about Health-Related Characteristics

The health-related characteristics were extracted from 23 questions from The World Health Organization Quality of Life-BREF (WHOQL-BREF), and subjective health status (1 question), subjective life quality (1 question), physical factors (7 questions), psychological factors (6 questions), and environmental factors (8 questions) were examined. The item consists of a 5-point Likert scale, and the negative item was reverse-coded so that the higher the combined score of the item was, the more positive it was (Cronbach's $\alpha = 0.90$).

Data Analysis

The data in this study were examined to use the statistical package for the social sciences (SPSS) Ver. 18.0 statistical program. Mean, standard deviation, and frequency (%) of the survey items were calculated, and PA was classified into continuous and categorical variables. An independent t-test and chi-square test was used for analysis of subjects' demographic and health-related characteristics. Multinomial logistic regression analysis was used for PA predictor extraction. All statistical significance levels (a) were set to .05.

Results and Discussion

The objective of this paper was to research the level of PA participation and the PA predictors according to demographics and health-related characteristics. As the dose-response relationship for PA and health is demonstrated, regular participation in PA can be expected to have a positive effect on promoting physiological, psychological, metabolic health, and fitness levels regardless of race (Pate et al. 1995; Williams, 2001).

The demographics and health-related characteristics of the subjects are as follows [Table 1]. After analysing gender, demographics and health-related characteristics were analysed. There were statistically significant differences in age, occupation, economy, subjective health status, subjective quality of life, physical factors, psychological factors, environmental factors, VIA and total-PA (TPA). Age (p = .044) was higher in females than males, and

female were higher in number of office workers (p = .001) and economic status (p = .045). Male were higher than female in subjective health status (p <.001), subjective quality of life (p = .004), physical factors (p = .006), psychological factors (p = .028), environmental factors (p <.001), VIA (p <.001) and TPA (p <.001).

Table 1: Demographics and health-related characteristics of subjects

Variables	Male n=243	Female n=236	Total n=479	t or x^2	p
Age (years)	22.79±3.57	23.47±3.83	23.13±3.71	-2.02	**.044**
Job Student Worker	 160 (57.3) 83 (41.5)	 119 (42.7) 117 (58.5)	 279 (58.2) 200 (41.8)	11.71	**.001**
Economy (2 million won) Above (%) Below (%)	 61 (43.6) 182 (53.7)	 79 (56.4) 157 (46.3)	 140 (29.2) 339 (70.8)	4.06	**.045**
Subjective Health status	3.35±0.98	2.90±0.97	3.13±1.00	5.03	**<.001**
Subjective quality of life	3.54±0.97	3.30±0.87	3.42±0.93	2.89	**.004**
Physical factors	22.28±4.07	21.30±3.65	21.79±3.89	2.75	**.006**
Psychological factors	20.12±3.83	19.34±3.80	19.74±3.83	2.21	**.008**
Environmental factors	28.34±5.59	26.11±5.17	27.24±5.48	4.53	**<.001**
Walk (METs)	174.32±262.74	195.73±275.84	184.87±269.20	-0.87	.385
MIA (METs)	161.05±265.57	121.44±199.99	141.54±236.14	1.85	.065
VIA (METs)	351.93±551.94	164.92±317.41	259.79±461.00	4.56	**<.001**
TPA (METs)	1149.38±1670.11	818.19±1058.16	986.20±1410.71	2.60	**<.001**

MIA: Moderate-intensity activity, VIA: Vigorous-intensity activity, TPA: Total-physical activity, METs: metabolic equivalents

The results of PA participation level according to the demographics and health-related characteristics of subjects are shown in [Table 2]. After classifying the PA level into the physical inactive group, regular PA group and health-promoting PA group, and analysing the level of PA participation according to demographics and health-related characteristics, economic status, subjective life quality, there were statistically significant differences for physical, psychological and environmental factors. According to Bauman et al. (2009), with the the analysis of PA of adults in 20 countries, men were more PA than women in various countries, such as the United States, Canada, Brazil, Belgium, Norway, China, Taiwan, Japan and Australia, etc (Bauman et al. 2009). In addition, participation in PA is the main factor in the subjective value of the individual, biological factors, psychological factors, social factors and environmental factors, which supports the findings of previous studies that these factors are intricately intertwined (Rutter et al. 2019; Rutter et al. 2017).

Increasing exercise intensity is a method of maximising health and fitness benefits, and the minimum exercise threshold level applies to most people except those with poor physical factors. MIA (heart rate, 40 to <60%) is recommended as the minimum exercise intensity for improving the health and fitness of adults, and a combination of MIA and VIA (heart rate, ≥60%) is an ideal way to improve the health and fitness (Haskell et al., 2007).

Table 2: Physical activity participation level according to demographic and health-related characteristics of the subjects

Variables		600METs↓	600METs↑	3000METs↑	Total	X^2	*p*
Gender	Male	126 (51.9)	96 (39.5)	21 (8.6)	243 (50.7)	8.87	**.012**
	Female	123 (52.1)	107 (45.3)	6 (2.5)	236 (49.3)		
Age (years)	19-24	186 (53.8)	139 (40.2)	21 (6.1)	346 (72.2)	6.43	.169
	25-29	47 (49.0)	47 (49.0)	2 (2.1)	96 (20.0)		
	30-34	16 (43.2)	17 (45.9)	4 (10.8)	37 (7.7)		
Job	Student	154 (55.2)	108 (38.7)	17 (6.1)	279 (58.2)	3.70	.157
	Worker	95 (47.5)	95 (47.5)	10 (5.0)	200 (41.8)		
Economy	Above center	57 (40.7)	73 (52.1)	10 (7.1)	140 (29.2)	10.08	**.006**
	Below	192 (56.6)	130 (38.3)	17 (5.1)	339 (70.8)		
Subjective Health status	Above center	171 (50.0)	154 (45.0)	17 (5.0)	342 (71.4)	3.83	.148
	Below	78 (56.9)	49 (35.8)	10 (7.3)	137 (28.6)		
Subjective quality of life	Above center	202 (49.3)	183 (44.6)	25 (6.1)	410 (85.6)	8.52	**.014**
	Below	47 (68.1)	20 (29.0)	2 (2.9)	69 (14.4)		
Physical factors	Above center	103 (42.0)	126 (51.4)	16 (6.5)	245 (51.6)	18.51	**<.001**
	Below	142 (61.7)	77 (33.5)	11 (4.8)	230 (48.4)		
Psychological factors	Above center	116 (45.3)	123 (48.0)	17 (6.6)	256 (53.8)	9.05	**.011**
	Below	130 (59.1)	80 (36.4)	10 (4.5)	220 (46.2)		
Environmental factors	Above center	93 (40.6)	121 (52.8)	15 (6.6)	229 (48.1)	22.67	**<.001**
	Below	154 (62.3)	81 (32.8)	12 (4.9)	247 (51.9)		

Based on these PA recommendations, we analysed the predictors of MIA and VIA using multinomial logistic regression analysis [Table 3, 4].

The results of analysing the predictors of medium-intensity activity (MIA) are shown in [Table 3]. To extract the MIA predictor, the reference category of the dependent variable was designated as the “inactive group”. The predictors of MIA were physical factors (0.63 times). If the reference category is reversed, the lower the physical health score, the higher the odds ratio included in the “inactive group” would be 1.58 times higher. In conclusion, the higher the physical health factor score, the more positive the effect of being included in the MIA group.

Table 3: Predictors of medium-intensity activity

Variables		B	SE	Wald	*p*	Odds ratio	95% CI	
							Lower	Upper
Intercept		.828	0.40	4.38	.036			
Gender	Male Female	-0.12 .	0.20 .	0.39 .	.532 .	0.88 .	0.60 .	1.30 .
Age (years)	19-24 25-29 30-34	-0.59 0.36 .	0.39 0.41 .	2.26 0.76 .	.132 .384 .	0.55 1.43 .	0.26 0.64 .	1.20 3.17 .
Job	Student Worker	.126 .	0.27 .	0.23 .	.633 .	1.14 .	0.68 .	1.91 .
Economy	Above center Below	-0.03 .	0.26 .	0.01 .	.906 .	0.97 .	0.58 .	1.62 .
Subjective Health status	Above center Below	-0.10 .	0.23 .	0.18 .	.674 .	0.91 .	0.58 .	1.43 .
Subjective quality of life	Above center Below	-0.32 .	0.32 .	1.05 .	.306 .	0.72 .	0.39 .	1.34 .
Physical factors	Above center Below	**-0.46** .	**0.23** .	**3.95** .	**.047** .	**0.63** .	**0.40** .	**0.99** .
Psychological factors	Above center Below	-0.25 .	0.25 .	1.01 .	.315 .	0.78 .	0.48 .	1.27 .
Environmental factors	Above center Below	-0.40 .	0.22 .	3.25 .	.071 .	0.67 .	0.43 .	1.04 .

The results of analysing the predictors of VIA are shown in [Table 4]. In order to extract VIA predictors, the reference category of dependent variables was designated as “inactive group”. The predictors of VIA were gender (1.75 times) and environmental factors (0.58 times). When the reference category is reversed, the lower the environmental factor score, the more the odds ratio included in the “inactive group” increased by 1.71 times. In conclusion, it was found that males were positive effect included in the VIA group in comparison to females. The higher the environmental factor score, the more positive effects of being included in the VIA group.

Table 4: Predictors of vigorous-intensity activity

Variables		B	SE	Wald	*p*	Odds ratio	95% CI	
							Lower	Upper
Intercept		-0.06	0.41	0.02	.878			
Gender	Male Female	**-0.56** .	**0.21** .	**7.29** .	**.007** .	**1.75** .	**1.17** .	**2.62** .
Age (years)	19-24 25-29 30-34	-0.03 0.31 .	0.41 0.43 .	0.00 0.53 .	.947 .466 .	0.97 1.36 .	0.43 0.59 .	2.19 3.15 .
Job	Student Worker	0.03 .	0.28 .	0.01 .	.908 .	1.03 .	0.60 .	1.78 .
Economy	Above center Below	-0.50 .	0.27 .	3.43 .	0.64 .	0.61 .	0.36 .	1.03 .
Subjective Health status	Above center Below	-0.19 .	0.25 .	0.58 .	.447 .	0.83 .	0.51 .	1.34 .
Subjective quality of life	Above center Below	-0.52 .	0.35 .	2.15 .	.142 .	0.60 .	0.30 .	1.19 .
Physical factors	Above center Below	-0.17 .	0.24 .	0.48 .	.489 .	0.85 .	0.53 .	1.36 .
Psychological factors	Above center Below	-0.15 .	0.26 .	0.35 .	.556 .	0.86 .	0.51 .	1.53 .
Environmental factors	Above center Below	**-0.54** .	**0.23** .	**5.32** .	**.021** .	**0.58** .	**0.37** .	**0.92** .

The results of analysing the predictors of the regular PA (600METs) of the subjects are shown in [Table 5]. To extract VIA predictors, the reference category of dependent variables was designated as “inactive group”. The predictors of regular PA were economic status (0.56 times), subjective quality of life (0.52 times), physical factors (0.56 times) and environmental factors (0.44 times). If the reference category is reversed, the odds ratio included in the “inactive group” will be increased to include economic status (1.73 times), subjective quality of life (1.91 times), physical factors (1.77 times), and environmental factors (2.27 times). In particular, the environmental factors are different when the means of transportation are considered, and the way to move geographically according to the place of residence by the nature of the Jeju area, and are dissimilar to the ratio of sports and leisure-related service businesses between administrative districts. This is partially explained by access problem to sports facilities for PA.

Table 5: Predictors of regular physical activity (600METs)

Variables		B	SE	Wald	*p*	Odds ratio	95% CI	
							Lower	Upper
Intercept		1.36	0.41	10.97	.001			
Gender	Male	-0.04	0.20	0.04	.844	0.96	0.65	1.42
	Female	.	.	.	.	.	.	.
Age (years)	19-24	-0.37	0.40	0.85	.357	0.69	0.31	1.52
	25-29	-0.20	0.42	0.22	.640	0.82	0.36	1.87
	30-34	.	.	.	.	.	.	.
Job	Student	-0.06	0.27	0.05	.818	0.94	0.56	1.59
	Worker	.	.	.	.	.	.	.
Economy	Above center	**-0.57**	**0.26**	**4.72**	**.030**	**0.56**	**0.34**	**0.95**
	Below	.	.	.	.	.	.	.
Subjective Health status	Above center	0.08	0.23	0.13	.720	1.09	0.69	1.71
	Below	.	.	.	.	.	.	.
Subjective quality of life	Above center	**-0.65**	**0.32**	**4.09**	**.043**	**0.52**	**0.28**	**0.98**
	Below	.	.	.	.	.	.	.
Physical factors	Above center	**-0.57**	**0.23**	**6.14**	**.013**	**0.56**	**0.36**	**0.89**
	Below	.	.	.	.	.	.	.
Psychological factors	Above center	0.24	0.25	0.91	.339	1.27	0.78	2.08
	Below	.	.	.	.	.	.	.
Environmental factors	Above center	**-0.82**	**0.23**	**13.17**	**.000**	**0.44**	**0.28**	**0.69**
	Below	.	.	.	.	.	.	.

The results of analysing the predictors of health promotion PA (3,000METs) are shown in [Table 6]. To extract the predictors of health promotion PA, reference categories of dependent variables were designated as “3,000 METs under group”. The predictors of health promotion physical activity were gender (4.14 times), age (0.15 times), and subjective health status (2.63 times). If the reference category is reversed, the odds ratios 25 to 29 years of age are included in “3,000 METs under group” will be 6.52 times higher. In conclusion, it was found that males registered a positive effect to be included in the health promotion PA group compared to women. The higher age and higher scores of subjective health status had a positive effect on the health-promoting group. Among the ages, 25-29 years are the time to prepare and adapt the social life as a job preparer or social beginner after graduating from university, and it is thought that 25-29 years of age showed a tendency to decrease the participation opportunity of regular PA for health promotion. Regular PA can improve the life quality and has a positive impact for physical and mental health. It is effective in risk reduction of chronic diseases, for example cardiovascular disorder, hypertension, hyperlipidemia, and obesity, and contributes to health promotion regardless of gender, age, and disease (Kyu et al. 2013).

Table 6: Predictors of health promotion physical activity (3000METs)

Variables		B	SE	Wald	*p*	Odds ratio	95% CI	
							Lower	Upper
Intercept		-2.66	0.74	13.10	.000			
Gender	Male	1.42	0.49	8.28	.004	4.14	1.57	10.91
	Female	.	.	.	.	.	.	.
Age (years)	19-24	-0.76	0.72	1.12	.291	0.47	0.11	1.92
	25-29	**-1.87**	**0.92**	**4.14**	**.042**	**0.15**	**0.03**	**0.93**
	30-34	.	.	.	.	.	.	.
Job	Student	0.40	0.59	0.45	.502	1.49	0.47	4.73
	Worker	.	.	.	.	.	.	.
Economy	Above center	-0.74	0.54	1.89	.169	0.47	0.16	1.37
	Below	.	.	.	.	.	.	.
Subjective Health status	Above center	**0.97**	**0.47**	**4.23**	**.040**	**2.63**	**1.05**	**6.62**
	Below	.	.	.	.	.	.	.
Subjective quality of life	Above center	-0.88	0.81	1.19	.275	0.41	0.09	2.01
	Below	.	.	.	.	.	.	.
Physical factors	Above center	-0.03	0.49	0.00	.956	0.97	0.37	2.56
	Below	.	.	.	.	.	.	.
Psychological factors	Above center	-0.21	0.54	0.16	.690	0.81	0.28	2.31
	Below	.	.	.	.	.	.	.
Environmental factors	Above center	-0.15	0.49	0.09	.760	0.86	0.33	2.27
	Below	.	.	.	.	.	.	.

According to a previous study, a meta-analysis of 174 papers (1980 ~ 2016) on “the effect of total PA on various chronic diseases” showed that five major diseases (breast cancer, colorectal cancer, diabetes, angina, cerebral infarction) have been reported as making the likelihood of onset to be reduced when the total PA is over 600 METs, which is also the minimum amount of PA recommended by the WHO. In particular, the more PA, the lower the probability of developing the disease, and the most effective amount of PA to prevent the five major diseases is emphasized that 3,000 ~ 4,000 METs per week. To perform 3,000 METs per week, 10 minutes a day to climb down the stairs, take a walk around to clean for 15 min, 20 min beds outdoors, running 20 minutes, 25 minutes for a bicycle can achieve 3,000METs (Kyu et al. 2013).

Predictors of PA of young adults suggested that they may be somewhat different according to previous studies because they are analysed based on specific regions. In addition, since the individual characteristics of the subjects were not applied in various ways, it is considered that there is a limitation of the cross-sectional survey studies in which the level of PA participation is underestimated or overestimated depending on the situation of the subject.

This limitation is significant in that it suggests the research direction that it is necessary to identify not merely the significance of PA participation but also the predictors of various and continuous PA in the future.

In conclusion, PA is intimately related to demographics and health-related characteristics. Despite the wide range of policies and initiatives that are involved in the participation of PA, they are still underdeveloped. Therefore, as shown in the predictors of PA, it is necessary to establish a concrete strategy that can improve the participation and accessibility of the individual's PA according to PA-friendly environment and social and physical support in consideration of demographics and health-related characteristics.

Conclusion

In conclusion, PA is closely related to demographics and health-related characteristics. However, despite a variety of policies and projects to encourage participation in PA, the situation is still insufficient. Therefore, as shown in the predictive factors of PA, it is necessary to establish a concrete strategy that can improve the participation and accessibility of an individual's PA through a PA-friendly environment and social and physical support in consideration of demographics and health-related characteristics.

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