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Effects of Physical Activity on Subjective Health Perception of Metabolic Syndrome Korean Elderly

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Abstract

This study was meant to examine the impact of physical work on the subjective health perspectives of older persons with metabolic illness in order to develop a well-being training programme and nursing intervention programme for patients with metabolic illness. The Korea Centers for Disease Control and Prevention evaluated the results of the 2019 National Health and Nutrition Examination Survey, as well as 1,735 older people for the data collection, served as the study's subjects. The statistical software SPSS 21.0 was used. To validate the segment properties of the review subjects, frequency analysis was done. In order to confirm the relationship between physical activity and perceived subjective health, metabolic illnesses such hypertension, dyslipidemia, and diabetes were the focus of the correlation study. Multiple regression analysis was used to examine the effect of physical work on the subjective health of the older population with metabolic infection. observing the connections between the study model's elements, factors like subjective health perception insight, physical work (strolling, strength work out), drinking, and home showed positive correlation. Respondent's age showed a negative connection between's subjective health perception discernments. Strolling, strength exercise, and liquor utilization affected subjective health perception in the hypertensive old populace. Strolling and strength practice in the dyslipidemic old affected subjective health perception. Strolling and strength practice in diabetic older affected subjective health perception. Actual work influences the subjective health perception impression of the older with metabolic condition.

Keywords: elderly; physical activity; subjective health perception; metabolic syndrome

1. INTRODUCTION

In Korea, the aging population has rapidly progressed due to the extension of life due to medical development and low birth rate, and as of 2015, the proportion of the elderly population has entered an aging society [1]. The surge in the elderly population is causing various social problems [1].

Older means to decline biologically, physically, mentally, socially, and profoundly with age, it is characterized in different ways as per social and social conditions and maturing peculiarities that show individual contrasts [2]. Korea's aging population is progressing rapidly, and the proportion of the elderly population, which is the composition of the elderly population (population 65 years and older) to the total population, is predicted to increase from 15.7% in 2020 to 40% in 2050 [3][41].

Metabolic disorders refer to diseases that originate from abnormal metabolism of glucose, fat, and protein, and mainly include hypertension, diabetes, dyslipidemia, and cardiovascular diseases [4].

In the Korean standard cause of disease classification (hereinafter referred to as KCD), high blood pressure (I10~I15), diabetes (E10~E14), and hyperlipidemia (E78) are metabolic diseases. Metabolic disease is a disease related to obesity. Obesity increases the risk of developing type 2 diabetes, obese people increase the risk of type 2 diabetes by 5 to 13 times, and the frequency of high blood pressure also increases. This significantly increases morbidity, disability, and mortality, as well as lowers quality of life. In particular, in the case of obesity and type 2 diabetes, the increase is remarkable enough to be called a global 'epidemic'. This increase is not a problem limited to some regions, but a global phenomenon. In particular, in Asia, where rapid industrialization

and westernization have progressed over the past 30 years, the rate of increase is significantly higher than in the West, and it is expected to cause serious economic and social problems in the future [5].

Metabolic syndrome is a stage that causes these metabolic diseases, and is a complex syndrome in which obesity and dyslipidemia, hypertension, hypertriglyceridemia, hypo-HDL cholesterol, and obesity as a risk factors for cardiovascular framework illness and diabetes, are corresponded [7]. Contrasted with sound grown-ups, it has been accounted for that grown-ups with metabolic disorder have multiple times higher occurrence of diabetes and twice higher frequency of heart illness [8].

At the point when an obese person gets more fit by 5 to 15%, the systolic circulatory strain diminishes by 10 mmHg and the diastolic pulse by 20 mmHg diminishes. A 50% reduction in the risk of developing diabetes has been reported, so weight loss is a possible treatment for a component of metabolic disease. In particular, the obese elderly suffer from a vicious cycle in which the level of daily activity and energy consumption gradually decrease as various bodily functions decline, resulting in a decrease in the will to treat obesity, which in turn makes treatment more difficult [6].

Exercise is one of the most effective methods to diminish the difference between life expectancy and healthy lifespan, and is a factor that helps maintain and promote health [11]. According to previous studies, exercise participation in the elderly has positive effects in cognitive-behavioral, psychosocial, physical, and medical aspects and contributes to the improvement of quality of life [11]. Exercise is very important for maintaining a healthy and independent life, preventing loss of function due to physical disability and lack of physical activity due to aging [12][42].

The elderly are exposed to cardiovascular diseases and other geriatric diseases due to decreased immune function. In this respect, the importance and necessity of exercise as an effective method for prevention and treatment of the elderly is emphasized, but it can be seen that the actual exercise rate is low at 19.8% [6]. Improvement and maintenance of physiological functions through regular exercise can be expected to delay and prevent various diseases, physical deterioration, aging, and changes in physiological functions, which are inevitably caused by the elderly [9]. It was argued that regular exercise had a positive efficacy on lipid metabolism [7], body mass index [7], insulin resistance [7], and blood pressure [7], thereby causing a decrease in CRP [7]. In a study measuring the vascular inflammatory responses of CRP and WBC according to different types of exercise, jogging and aerobic dancing lowered the increase in vascular inflammation [10].

Subjective health status refers to one's own health status evaluated by oneself, and is a valid indicator for evaluating personal health status that cannot be measured by medical methods, including physical, psychological, and social aspects, and is widely used to measure the current health status of the elderly [13-14][43]. As the number of chronic diseases such as metabolic syndrome increases, it has a negative effect on subjective health perception. According to the results of a 2016 survey on the subjective health of the elderly by the Ministry of Health and Welfare, ‘good’ was lower at 23.2% for those in their 60s and 21.4% for those in their 70s [15]. Subjective health evaluation of one's health can change the symptoms and aspects of chronic disease. Negative evaluation affects health behavior and causes negative results on disease pattern, whereas positive evaluation affects the motivation for self-health behavior, preventing disease and lowering mortality [13-14]. Metabolic syndrome is a chronic disease, and a positive evaluation of the subjective health of the elderly is important for continuous health management implementation.

The increase in metabolic diseases is putting a burden on national medical expenses. In fact, hypertension and diabetes mellitus are single-morbid diseases, and they are the first and second most common medical expenses, so reducing metabolic diseases is an important issue for living a healthy life both economically and physically [16].

2. METHODOLOGY

2-1 Study Design

This study was endeavored to affirm the causal connection between physical work and health status perception in the old populace. The connection between physical work and health status of the old populace can

be affirmed by inspecting the impact of physical work on subjective health insight for patients with metabolic disorder.

Research model was laid out to concentrate on the impact of actual work on subjective health discernment among the older north of 65 years old with metabolic condition. In this research model, independent variables were set as physical activity (walking, strength training), health behavior (drinking, smoking), place of residence, and age, and dependent variables were set as respondents' subjective health perception. The metabolic diseases to be observed in this study are hypertension, dyslipidemia, and diabetes. The data were calculated by counting “the number of days walks per week” for walking with physical activity and “the number of days for strength training per week” for strength training. In terms of health behavior, alcohol consumption is the amount of alcohol consumed at one time, and smoking amount is the average daily amount of cigarettes smoked and counted as cigarettes. Therefore, in this study, in order to confirm the relationship between physical activity and health perception in the elderly population, the causal relationship was confirmed for each patient with metabolic disease.

2-2 Study Subjects

The subjects of this study are the old population matured 65 years or more established among the information collected by the probability sampling method to mirror the attributes of the population. This data is a statistical survey directed at the public level focusing on the whole populace of the Republic of Korea, and is as of now managed by the "Korea Centers for Disease Control and Prevention". The name of the overview for this information is the 2019 National Health and Nutrition Survey. The prevalence of metabolic disorders among older people, such as hypertension, dyslipidemia, and diabetes, is the main focus of this study.

2-3 Research Tools

2.3.1 Physical activity: Physical activity, excluding sleeping, is defined as physical activity done while working, travelling, or engaging in social activities. The data collected to investigate the physical activity of the research subjects in this study were data from the “National Health and Nutrition Survey conducted in 2019”. Walking, strength training, and this questionnaire were designed as follows. That is, the question as “In the past week, on how many days did you walk for at least 10 minutes at a time?”, the response to this was designed as “Never, 1 day, 2 days, 3 days, 4 days, 5 days, 6 days, 7 days (every day)”. And asked, “In the past week, on how many days have you been doing strength training such as push-ups, sit-ups, dumbbells, weights, and iron bars?”, and used the data collected through the questionnaire designed to answer “No response at all, 1 day, 2 days, 3 days, 4 days, 5 days or more, etc.” This study was attempted to affirm the causal connection between active work and health status perception in the old populace. The connection between physical work and health status of the older populace can be affirmed by analyzing the impact of actual work on subjective health perception for patients with metabolic condition.

2.3.2 Subjective health perception: Subjective health perception refers to the degree to which respondents subjectively perceive their usual health. Subjects' subjective health perceptions used in this study used items designed to examine respondents' subjective health in the 2019 National Health Survey. That is, in this study, the question “What do you usually think about your health?” was asked, and the collected data were used as question items designed such as “very good, good, average, bad, very bad”

2-4 Data Collection Procedure

The initial data from the "National Health Survey and the Korea Centers for Disease Control and Prevention," which were used in this study, were approved for use by the specialist who submitted the application. Customers that use this quantifiable data have sworn to abide by the rules and only use it for statistical research. This data represents the initial collection of the 8,110-person effective sample. In this study, 1,735 elderly people who were the subject of the study selected cases from the total valid sample and used the data. The “National Health and Nutrition Examination Survey” used in this study is data from January to December 2019.

2-5 DATA ANALYSIS METHOD

In this review, statistical analysis of data was performed to affirm the connection between physical work and subjective health perception of the older populace. The measurable program utilized was SPSS 21.0, and recurrence investigation was performed on segment attributes to distinguish the example qualities of the study subjects. What's more, correlation examination was performed to affirm the correlation between's active work and health perception. In appendage, various relapse examinations were performed to set the impact of active work on the subjective health of the old populace with metabolic sickness.

2. RESULTS

3-1 Demographic Characteristics

The number of older people aged 65 and over was 1,735 according to the 2019 National Health Survey data, and [Table 1] shows the characteristics of the respondents by segment. Regarding the segment characteristics of the respondents, there were 57.1% females and 42.9% males. The age of the respondents was 31.1% in their 60s, 48.8% in their 70s, and 20.1% in their 80s or older. The marital status of respondents was 66.2% living together, 1.1% separated, 28.0% widowed, and 0.8% not married. The respondents' residence was found to be dong, 71.3%, and eup, myeon, 28.7%. In terms of personal income, 20.0% of the lower quintiles, 20.0% of the lower middle, 19.8% of the middle, 20.1% of the upper middle, and 20.1% of the upper class. The educational level of respondents was 54.9% with “elementary school or less”, 16.4% “middle school graduate”, 18.9% “high school graduate”, and 9.8% “college graduate or higher”. As for the health behavior of the respondents, lifelong smoking was found to be 0.7% of less than 5 packs (100 cigarettes) and 37.4% of 5 packs or more (100 cigarettes) or more. 25.1% of respondents said that they had parallel drinking, and 73.0% said yes [Table 1].

Table 1: Demographic characteristics (N=1735)

Category	Item	Frequency	%	Category	Item	Frequency	%
Gender	male	744	42.9	residence	dong	1237	71.3
	female	991	57.1		eup and myeon	498	28.7
Age	65-69 years old	540	31.1	personal income	lower quintiles	345	20.0
	70-79years old	846	48.8		lower middle	345	20.0
	> 80years old	349	20.1		middle	342	19.8
Marital Status	cohabitation	1148	66.2		upper middle	346	20.1
	separation	19	1.1		upper	346	20.1
	bereavement	486	28.0		< “elementary school”	839	54.9
	divorce	67	3.9	level of education	“middle school”	250	16.4
	not applicable	13	0.8		“high school”	288	18.9
Smoking (Lifetime)	< 5 packs	12	0.7		> college	150	9.8
	>5 packs	618	37.4	drinking (Lifetime)	None	425	25.1
	never smoked	1023	61.9		exist	1233	73.0

3-2 Research Model Correlation

To determine the relationship between the components that were remembered for the exploratory model, association analysis was done.The factors of the research model were subjective health perception, the quantity of long stretches of walking each week, the quantity of long periods of solidarity preparing each week, how much alcohol consumed per meeting, the number of cigarettes smoked per day, dong/eup-myeon residence, and age.

Using Pearson's correlation analysis, the relationship between the variables was ascertained, and the results are shown in [Table 2]. Because of examining the correlation between the research model variables, variables such as subjective health perception, physical activity (walking, strength exercise), drinking, and residence show positive correlations. Respondent's age showed a negative correlation between subjective health perception and age.

Table 2: Correlation of Research Models

Division	Correlation Coefficient	Subjective Health	Number of Walking Days	Number of Days of Strength Training	Amount of Alcohol	Smoking Cigarette A Day	Residence	Age
Subjective Health	r(1539)	1						
Number Of Walking Days	r(1525)	.208**	1					
Number Of Days Of Strength Training	r(1530)	.160**	.163**	1				
Amount Of Alcohol	r(1657)	.110**	.079**	.157**	1			
Smoking Cigarette A Day	r(1653)	.021	-.029	-.017	.238**	1		
Residence	r(1735)	.064*	.163**	.121**	.065**	.002	1	
Age	r(1735)	-.111**	-.166**	-.116**	-.228**	-.114**	-.083**	1

3-3 Relationship between Physical Activity and Subjective Perception of Health Status in Hypertensive Elderly

The goal of this study was to confirm the causal relationship between physical work and older peoples' perceptions of their health state.The connection between physical work and health status of the old populace can be affirmed by inspecting the impact of active work on health status perception for patients with metabolic condition.

Table 3: The association between exercise and subjective health perception in elderly hypertensive people

Model		Non-Standardized Coefficients		Standardization Coefficient	T	Collinearity Statistics	
		B	Standard Deviation	β		Tolerance	VIF
Subjective Health Perception	(constant)	3.084	.495		6.228***		
	Number Of Walking Days	.054	.012	.161	4.610***	.932	1.073
	Number of Days of Strength Training	.057	.020	.100	2.864**	.935	1.069
	Drink Per Serving	.027	.013	.078	2.147*	.869	1.151
	Smoking Cigarette	.003	.008	.014	.395	.930	1.076

	A Day						
	Residence	.002	.070	.001	.027	.963	1.039
	Age	-.008	.006	-.042	-1.181	.900	1.111
F=8.567 R^2=.058 $Adj.R^2$=.052							

3-4 Relationship between Physical Activity and Subjective Health Perception of Dyslipidemia Elderly

The impact of physical work on subjective health perception of dyslipidemia old is displayed in [Table 4]. Since the importance likelihood of this model is 0.000, the regression model is measurably critical at the importance level of 0.05. It was found that walking and strength practice in the older population with dyslipidemia meaningfully affected subjective health perception.

Table 4: The connection between physical work and subjective health perception in dyslipidemia older

Model		Non-Standardized Coefficients		Standardization coefficient	t	Collinearity Statistics	
		B	Standard Deviation	β		Tolerance	VIF
Subjective Health Perception	(Constant)	3.134	.646		4.852***		
	Number Of Walking Days	.063	.015	.185	4.157***	.946	1.057
	Number of Days of Strength Training	.088	.026	.148	3.371**	.973	1.028
	Drink Per Serving	.015	.017	.042	.910	.878	1.139
	Smoking Cigarette A Day	-.001	.010	-.005	-.104	.932	1.073
	Residence	.037	.099	.016	.374	.971	1.030
	Age	-.010	.009	-.053	-1.179	.920	1.086
F=6.712 R^2=.076 $Adj.R^2$=.065							

3-5 Relationship between Physical Activity and Subjective Perception of Health Status in Diabetic Elderly

The impact of physical work on the subjective health perception of diabetic old was displayed in [Table 5]. Since the importance likelihood of this model is 0.000, the regression model is statistically significant at the importance level of 0.05. It was found that strolling and strength practice in the older populace with diabetes affected subjective health perception in the positive heading.

Table 5:The association between physical activity and diabetics' perceived health perceptions

Model		Non-Standardized Coefficients		Standardization coefficient	t	Collinearity Statistics	
		B	Standard Deviation	β		Tolerance	VIF
Subjective Health Perception	(Constant)	3.151	.862		3.654***		
	Number of Walking Days	.062	.019	.183	3.253***	.922	1.085

	Number of Days of Strength Training	.097	.032	.169	3.008**	.920	1.087
	Drink Per Serving	.001	.019	.005	.078	.870	1.150
	Smoking Cigarette A Day	.021	.012	.101	1.792	.918	1.089
	Residence	-.116	.117	-.055	-.990	.932	1.073
	Age	-.010	.012	-.049	-.853	.881	1.135
F=4.909 R^2=.086 $Adj.R^2$=.068							

3. DISCUSSION

This study dissected the impact of physical work on the view of subjective health in Korean older with metabolic disorder. Through this, this study was directed to recommend the significance of physical work and give essential information to creating health education materials and nursing intercession programs for metabolic disorder old.

Subjective health is a self-evaluation of one's current health status [17], which affects the course of chronic diseases according to positive or negative evaluations [18]. Subjective health affects the motive for self-health behavior, and when subjective health is positively recognized and evaluated, active and continuous health behaviors are made for one's disease [19].

Because of examining the correlation between the research model variables, variables such as subjective health perception, physical activity (walking, strength exercise), drinking, and residence showed positive correlations. The respondents' subjective perception of health status and age showed a negative correlation. It can be seen that when physical activity such as walking or strength training increases, subjective health awareness increases, and as alcohol consumption increases, subjective health awareness also increases. It was found that the perception of subjective health increased when living in a rural area rather than living in a city. However, it can be seen that as the age increases, the perception of subjective health decreases. The amount of smoking of respondents was found to have no correlation with subjective health perception. Through this, it can be seen that subjective health awareness is high when living in a rural area and continuing physical activity. It was found that when the elderly subjectively perceived that they were healthy, they did more physical activities such as walking and strength training. Also, the elderly who subjectively perceived themselves as healthy were found to drink more. In general, drinking is perceived as an unhealthy act, but in the case of the elderly who perceive themselves to be healthy, the psychological state of being healthy seems to favor drinking. It was found that the older the elderly, the lower the subjective health perception. It seems that the elderly are also aware of the various effects of physical aging that occur with increasing age. In the case of residence, it is thought that the increase in subjective health perception in the case of living in a rural area is due to the advantages of environmental factors in the case of living in a rural area.

In a study by Kim Min-kyung [20], the subjective unhealthy perception rate increased as the level of education decreased. The pervasiveness of chronic sicknesses and the discernment that they were undesirable were fundamentally higher in the least pay bunch and the straightforward laborer bunch; the subjective unhealthy perception rate according to social class was higher in men than in women. Lee Ok-jin's meta-analysis study on the relationship of subjective health in the elderly, subjective health perception has the largest effect size of spouse support, and then income, education level, occupation, child support, assets, support outside the family, family support, and social activities were in the following order. In the case of elderly women, the positive influence of income on subjective health decreased, and the influence of support outside the family increased, indicating that there were differences according to age and gender [21]. In previous studies, subjective health showed a significant difference according to general characteristics such as income, education level, and mental

health factors [22], indicating that there was a difference from this study. Therefore, it is necessary to study the subjective health in consideration of the general characteristics of the elderly in the future.

Metabolic syndrome refers to complex metabolic diseases including abdominal obesity, high blood sugar, cholesterol levels, hypertension, and high insulin sensitivity [23]. Metabolic syndrome is a disease that is increasing worldwide as we come to modern times [24-25].

Recently, Korean people's eating habits and lifestyles have also been westernized, and at the same time, lack of exercise has become increasingly severe, increasing the risk of various chronic diseases [26].

Accordingly, according to the 2019 data from the “Korea Centers for Disease Control and Prevention”, in Korea, metabolic syndrome is on the rise from 19.6% in 2013 to 22.3% in 2019 [27]. As the metabolic syndrome increases, the mortality rate due to it is also increasing [28].

The number of walking and strength training days per week and their effects on the subjective health perception of hypertensive older participants were examined, and alcohol consumption per session of the hypertensive elderly increased subjective health perception. Among the variables of this research model, it seems appropriate that walking and strength exercise have positive effects on the perception of health status.

The effect of physical activity on the diabetic elderly's impression of their own health was examined, and the quantity of strolling days out of each week and strength practice days out of every week in diabetic old individuals expanded subjective health awareness [44].

Currently, more than 1/5 of the global adult population suffers from metabolic syndrome, and it is known that the proportion is significantly increasing according to the current trend [29-30]. There are many preventable factors in the pathogenesis of metabolic syndrome. These included decreased physical activity, weight gain, excessive alcohol consumption, and poor quality dietary behavior [31].

Therefore, in order to prevent such metabolic syndrome, systematic management of daily lifestyle will be a very important part. If not properly managed, metabolic syndrome is a direct and indirect cause of death due to diabetes, cardiovascular disease, and is a major cause of increased medical costs worldwide [32].

Physical work alludes to all body developments in day to day existence, including ordinary activity that requires energy utilization over a consistent state, to any development of the body those outcomes in a significant expansion in energy consumption through the compression of skeletal muscles [33-34]. It has been accounted for that a decline in actual work brings down the degree of muscle strength and cardiopulmonary capability, in this manner expanding the rate of metabolic condition and influencing the frequency of grown-up illnesses, for example, hypertension and diabetes [35].

Regular physical activity helps to reduce blood pressure and has been shown to be effective in exercise and resistance exercise to improve endurance [36]. In addition, increased physical activity and regular exercise improve insulin sensitivity, improve blood cholesterol, and manage blood sugar appropriately to improve blood sugar. Despite the steady progress of these many studies that physical activity is an important intervention in metabolic syndrome, the obesity rate continues to increase over time, while regular physical activity participation is reported to have rapidly decreased [38].

Subjective health, along with clinical health status, is one of the indicators to predict the level of health; it is more subjective than objectively measured clinical tests. Although it has limitations in that it is evaluated directly or indirectly through medical history or medical experience, it is convenient to measure and is evaluated as a meaningful variable in predicting the risk of death [37], [40].

Self-evaluation of health is a significant file that consolidates close to home and physical elements including prosperity and life fulfillment. Sensations of chronic health are physical pain or distress, yet additionally an outflow of mental and social results related with a specific issue [39]. Therefore, it is important to have correct subjective health awareness through continuous health information and health behavior.

4. CONCLUSIONS

In this study, subjective health status recognition, physical activity (walking, muscle exercise), drinking, and residence showed a positive correlation. Age and perceived health state have a bad association. In other words, it was found that the more positively one perceives one's health status, the more physical activity increases, and he drinks more and lives in the city. In addition, it was found that as the age increases, subjective health patterns were perceived negatively. It was found that the elderly with high blood pressure who exercise walking, muscle exercise, and drinking had higher subjective health perception. The elderly with dyslipidemia and diabetes who exercise walking and muscle strength were found to have high subjective health perception. Through this, it can be seen that physical activity affects the subjective health status perception of the elderly with metabolic syndrome. The findings of this study are thought to be basic information for the creation of health education data and nurse intervention programmes for individuals with metabolic syndrome.

First, further research is needed on the variables influencing metabolic syndrome and physical activity in the elderly.Second, it is proposed to develop an intervention program to reduce metabolic syndrome in the elderly and conduct research to identify its effects. Third, as it does not include past or family history, which can be an important trigger of metabolic syndrome, additional research is needed.

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Authors' contributions

All authors agreed to be accountable for all elements of this work and contributed to data analysis, drafting, and revision of the publication.

Declaration of Conflicts of Interests

Authors declare that they have no conflict of interest.

Consent for Publication

Each author has reviewed the article and is aware that it will be published in the Journal for Reattachment Therapy and Developmental Disabilities.

Data Availability Statement

Due to privacy concerns, the database created and/or analysed during the current work is not publically accessible, however it is available from the corresponding author upon justifiable request.

Declarations

All works are original, according to the author(s), and this material hasn't been published in any other journal.

REFERENCES

[1] Statistical Research Institute. Korean social trends 2015, Research Report. Daejeon, Statistics Korea, 2015, Report No.11-1240245-000014-10.
[2] I. D. Han, C. D. Koo, "Effect of forest healing program on the resiliense of elderly people in urban forest," Journal of People, Plants, and Environment, vol. 21, no. 4, pp. 293-303, 2018. https://doi.org/10.11628/ksppe.2018.21.4.293
[3] Statistics Korea, Statistical Yearbook, 2020.
[4] U.S. National Library of Medicine (n.d.). Retrieved May 16, 2017, from https:// medlineplus.gov/ metabolicdisorders.html
[5] Ministry of Health and Welfare. 2004 National Health Statistics. Center for Disease Control, 2015.
[6] Korean Society for Obesity. Guidelines for the treatment of obesity, pp. 1-198, 2012.

[7] Alberti, K. G., Eckel, R. H., Grundy, S. M., Zimmet, P. Z., Cleeman, J. I. "Harmonizing the metabolic syndrome: a joint interimstatement of the International Diabetes Federation Task Force on Epidemiology and Prevention; National Heart, Lung, and BloodInstitute ; American Heart Association; World Heart Federation ; International Atherosclerosis Society; and International Associationfor the Study of Obesity," Circulation, vol. 120, no. 16, pp. 1640-1645, 2009.bhttps://doi.org/10.1161/CIRCULATIONAHA.109.192644

[8] Harvard Mental Health Letter. Metabolic syndrome and mental illness: Weight gain and other unhealthy attributes increase risk of diabetes and heart disease, 2011. www.health.harvard.edu

[9] Y. J. Jeon, J. K. Lee. "Effects of aerobic exercise on the improvement of immunity in middle-aged women," Korean journal of physical education, vol. 45, no. 4, pp. 463-471, 2006.

[10] King, D. E., Carel, P., MainousⅢ, A. G., & Pearson, W. S. "Inflammatory markers and exercise : Difference related to exercise type," Med. Sci. Sports Exerc., vol. 35, no. 4, pp. 575-581, 2003, https://doi.org/10.1249/01.MSS.0000058440.28108.CC

[11] Gremeaux V, Gayda M, Lepers R, Sosner P, Juneau M, Nigam A. "Exercise and longevity," Maturitas, vol. 73, no. 4, pp. 312-217, 2012. https://doi.org//10.1016/j.maturitas.2012.09.012

[12] Daley MJ, Spinks WL. "Exercise, mobility and aging," Sports Medicine, vol. 29, no. 1, pp. 1-12. 2000. https://doi.org/10.2165/00007256-200029010-00001

[13] Yoo DH, Yeo IS. "Relationship among subjective health recognition, activities of daily living (ADL) exercise capability andsocial support on the elderly," The Korean Journal of PhysicalEducation, vol. 52, no. 1, pp. 351-361, 2013.

[14] Ko YH. "The relationships among the physical competence,subjective health status, and health promoting behavior ofelderly participating in health activity program," Journal of Digital Convergence, vol. 14, no. 12, pp. 571-581, 2016. https://doi.org/10.14400/JDC.2016.14.12.571

[15] Korean health care as seen in OECD statistics, Ministry of Health and Welfare, 2018.

[16] S. E. Lee, "The effect of vision on self-rated health in older adults and the mediating role of Social Participation," Institute of Special Education &Rehabitation Science, Daegu University. vol. 55, no. 4, pp. 27-41, 2016. https://doi.org/10.23944/isers.2016.09.55.4.2

[17] Health Insurance Corporation Statistical Yearbook, pp. 1-65, 2014.

[18] S. Y. Hong, "Determinants of self-rated health in sedentary older adults," Korean Society for Health Education and Promotion, vol. 25, no. 4, pp. 67-82, 2008.

[19] Connelly, J. E., Philbrick, J. T., Smith Jr, G. R., Kaiser, D. L., Wymer, A. "Health perceptions of primary care patients and the influence on health care," Med Care, vol. 27, no. 3, pp. 99-109, 1989. doi: 10.1097/00005650-198903001-00009.

[20] M. K. Kim, W. J. Jung, S. J. Im, S. J. Yoon. J. K. Lee, E. K. Kim, L. J. Go. "Socioeconomic inequity in self-rated health status and contribution of health behavioral factors in Korea," Journal of Preventive Medicine and Public Health, vol. 43, no. 1, pp. 50-61, 2010. https://doi.org/10.3961/jpmph.2010.43.1.50

[21] O. J. Lee, "Meta-analysis of the factors related to self-rated health among elderly - Focused on psychological dispositions, social-economic status," The Journal of the Korea Contents Association, vol. 17, no. 4, pp. 424-433, 2017.

[22] S. M. Jang, "Factors of influencing subjective health status in the adults with chronic disease - Focusing on socio-economic status of Diabetics," Korea Academy of Mental Health social work, vol. 43, no. 2, pp. 32-59, 2015.

[23] Isomaa BO, Almgren Peter, TuomiTiinamaija, Forsen Bjorn, Lahti Kaj, Nissen Michael, TaskinenMarja-Riitta, Groop Leif., "Cardiovascular morbidity and mortality associated with the metabolic syndrome," Diabetes Care, vol. 24, no. 4, pp. 683-689, 2001. https://doi.org/10.2337/diacare.24.4.683

[24] R. W. Ma, "The effects of combined exercise program on the body composition, metabolic Syndrome risk factor in middle-aged women," Asia-pacific Journal of Convergent Research Interchange, FuCoS, vol. 6, no. 3, pp. 57-68, 2020. http://dx.doi.org/10.21742/apjcri.2020.03.06

[25] Eckel RH, Grundy SM, Zimmet PZ. "The metabolic syndrome." Lancet, vol. 365, no. 9468, pp. 1415-1428, 2005. https://doi.org/10.1016/S0140-6736(05)66378-7

[26] J. S. Kang, H. S. Kang, E. K. Yun, H. R. Choi, "Factors influencing health behavior compliance of patients with metabolic syndrome," Korean Journal of Adult Nursing, vol. 24, no. 2, pp. 191-199, 2012.

https://doi.org/10.7475/kjan.2012.24.2.191

[27] Korea Centers for Disease Control and Prevention, 2019 National Health Statistics. Seoul, 2019.

[28] FeldeisenFeldeisen Sabrina E, Tucker Katherine L. "Nutritional strategies in the prevention and treatment of metabolic syndrome," Applied Physiology,Nutrition, and Metabolism, vol. 32, no. 1, pp. 46-60, 2007. https://doi.org/10.1139/h06-101

[29] P. Ranasinghe, Y. Mathangasinghe, R. Jayawardena, A. P. Hills, A. Misra., "Prevalence and trends of metabolic syndrome among adults in the asia-pacific region: a systematic review," BMC Public Health, vol. 17, no. 1, pp. 1-9, 2017. https://doi.org/10.1186/s12889-017-4041-1

[30] M. R. Lee, "A study on the countermeasure of the integrated care network for the elderly to promote community cooperation and connection," Asia-pacific Journal of Convergent Research Interchange, SoCoRI, vol. 5, no. 1, pp. 65-75, 2019. http://dx.doi.org/10.21742/apjcri.2019.03.07

[31] Carenethon Mercedes R, Loria Catherine M, Hill James O, Sidney Stephen, Savage Peter J, Liu Kang. "Risk factors for the metabolic syndrome: The coronary artery risk development in young adults(CARDIA) study," Diabetes Care, vol. 27, no. 11, pp. 2707-2715, 2004. https://doi.org/10.2337/diacare.27.11.2707

[32] RadhakrishnanJeyasundar, SwaminathanNarasimman, Pereira Natasha M, Henderson Keiran, Brodie David A. "Acute changes in arterial stiffness following exercise in people with metabolic syndrome," Diabetes & Metabolic Syndrome: Clinical Research & Reviews, vol. 11, no. 4, pp. 237-243, 2017. https://doi.org/10.1016/j.dsx.2016.08.013

[33] Wagner Dale R. "ACSM's resource manual for guidelines for exercise testing and prescriptio, 5th Edition," Medicine and Science in Sports and Exercise, vol. 37, no. 11, pp. 2018, 2005). https://doi.org/10.1249/01.mss.0000189075.58666.c2

[34] S. Y. Goh, E. K. Yoon, M. N. Lee, "Effectiveness of physical activity program in improving the self-esteem of female elderly in rural areas," Asia-pacific Journal of Convergent Research Interchange, FuCoS, vol. 7, no. 11, pp. 151-163, 2021. http://dx.doi.org/10.47116/apjcri.2021.11.13

[35] Basen-Engquist Karen, Chang Maria., "Obesity and cancer risk: Recent review and evidence," Current Oncology Reports, vol. 13, no. 1, pp. 71-76, 2011. https://doi.org/10.1007/s11912-010-0139-7

[36] Cox KL. "Exercise and blood pressure: Appling findings from the laboratory to the community settin," Clinical and Experimental pharmacology and physiology, vol. 33, no. 9, pp. 868-871, 2006. https://doi.org/10.1111/j.1440-1681.2006.04456.x

[37] Schauer I. E, Reusch J. E. B, Regensteiner J. G., "Exercise in metabolic syndrome and diabetes: A central role for insulin sensitivity," Contemporary Endocrinology, pp. 293-323, 2020. https://doi.org/10.1007/978-3-030-25057-7_18

[38] D. G. Kim, J. S. Jeong, "Relationship among daily stress, Perceived health and successful aging of older people Participating in Physical Activity," Journal of Sport and Leisure Study in Korea, vol. 54, no. 1, pp. 913-924. 2013. https://doi.org/10.51979/KSSLS.2013.12.54.913

[39] Y. H. Kang, H. L, Kim, "Socioeconomic mortality inequality in Korea: Mortality follow-up of the 1998 National Health and Nutrition Examination Survey (NHANES) data," Journal of Preventive Medicine and Public Health, vol. 39, no. 2, pp. 115-122, 2006.

[40] C. U. Heo, Y. S. Choi, "The effect of physical activity on subjective health status perception in patients with metabolic disease," 2022 1st Domestic and International Integration confeence, vol. 1, no. 1, pp. 44, 2022.

[41] T. Zhang. "Comparative Research on the Elderly Community". International Journal of Social Welfare Promotion and Management, vol.7, no.3, Nov. 2020, pp.39-52, doi:10.21742/IJSWPM.2020.7.3.06

[42] R. Ma and Y. -J. Jee. "Effects of Combined Exercise on Exercise Adherences and Health Self-Efficacy in Middle-aged Women". International Journal of Advanced Nursing Education and Research, vol.4, no.2, Aug. 2019, pp.45-50, doi:10.21742/IJANER.2019.4.2.08

[43] D. Park and K. S. Lee. "The Comparison on the Effect of Thoracic Flexibility Exercise and Lumbar Stabilization Exercise on Pain and Heart Rate Variability of Patients with Chronic Low Back Pain". International Journal of Advanced Nursing Education and Research, vol.5, no.1, Apr. 2020, pp.25-30, doi:10.21742/IJANER.2020.5.1.03

[44] Y. H. Nam. "The Effects of Physical Activity Programs on Life Satisfaction of the Elderly". Journal of Nursing Methodology, NADIA, vol.1, no.1, June (2020), pp. 25-30, doi: 0.33832/jnm.2020.1.1.04