

# Exercise Adherence Model of Middle-Aged based on Theory of Self-determination

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## Abstract

The purpose of this study was to construct and validate a middle - aged exercise adherence model. The model was designed based on self - determination theory. Participants were 215 middle-aged men and women aged 40-60 who had been exercising for more than six months. Data was collected from four big cities of Seoul, Busan, Gwangju and Daejeon in Korea, using a questionnaire consisting of basic psychological needs, intrinsic motivation, social support, and exercise adherence. Data were analyzed with SPSS 19.0 and AMOS 20.0. Social support and exercise adherence of the questionnaire were partially revised and verified by confirmatory factor analysis. The results of the study were as follows. The model's fit indices: GFI = .938, AGFI = .915, NFI = .912, CFI = .941, and RMSEA = 0.041. The model satisfied the model fit of the structural model equation. This study model based on self - determination theory was confirmed that basic psychological needs, intrinsic motivation, and social support were important factors for the middle - aged's exercise adherence. Basic psychological need and intrinsic motivation had a direct influence on the adherence of exercise, and social support indirectly influenced the exercise adherence through intrinsic motivation. Both basic psychological needs and social support directly affected internal motivation. The most influential factor in the middle - aged's exercise adherence was intrinsic motivation. In conclusion, it was found that intrinsic motivation such as interest and fun is important for the middle - aged to continue the exercise. Also, the basic psychological needs were important for middle aged's exercise adherence. The results of this study will provide basic data for restoring or maintaining health by continuing exercise. Strategies that enhance intrinsic motivation are needed when a chronic ill person needs to continue long-term exercising.

▶ Keyword: Exercise, Middle-aged, Motivation, Need, Self-determination theory

## I. Introduction

Middle-aged exercise is essential for health. Even if you know that exercise is healthy, it is not easy to participate in exercise. It is also difficult to continue for a long period even if one begin exercising.

In middle age, aging begins and health problems are likely to occur. In addition, the support of the elderly parents and the independence of their adult children can lead to mental

health problems such as depression due to economic burden and empty nest. Middle-aged women experience menopause. Menopause is not only a loss of youth, but also a chance to find a new self. They are also at risk for cardiovascular disease or osteoporosis due to a rapid decline in female hormones. Health care is more important to adapt to the various physical and mental changes of middle age.

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For middle-aged health, regular health checkups, nutrition, and exercise are important. Among these, exercise has been recommended as an essential factor for middle-aged health. Regular exercise in middle age was known to be beneficial to mental health as well as physical health.

In the middle ages, a steady physical exercise is essential for health because the metabolism slows down and weight gain and insulin requirement increase, which can lead to various diseases such as diabetes, arteriosclerosis, hypertension and myocardial infarction[1]. There was a significant difference in the middle-aged body image depending on the exercise, and the body image and the depression showed a negative correlation[2]. Middle-aged women suffer from menopause, which can lead to osteoporosis due to a decrease in estrogen. There was a statistically significant difference in the exercise-related prevention of osteoporosis education among women aged 35-45 compared to the control group[3]. Cardiovascular disease prevention education in postmenopausal women includes exercises on cardiovascular disease prevention knowledge and health behavior practice items[4]. However, according to a study of the relationship between aging and physical activity in the urban middle-aged in 2015, 62.6% of the participants did not perform physical activities[5]. The fact that middle-aged exercise participation rate was not even half showed that there was a gap between knowledge and practice. Therefore, the factors connecting the gap between knowing and doing should be identified.

Barriers to participation in physical activity and exercise among middle-aged and elderly individuals were lazy, lack of motive, time, exercise facility, friends[6]. Therefore, it is necessary to pay attention to the factors that sustain the exercise in the middle age which keeps the exercise despite the obstacles of these various exercises.

Therefore middle-aged's exercise needed to be support not only the internal factors but also the exercise environment such as facilities or colleagues.

According to Self-determination theory(SDT), individual's basic psychological needs and intrinsic motivation are important to keep to do specific behavior[7]. Autonomy support was effective in changing health behaviors such as smoking cessation[8]. In SDT, when basic psychological need was satisfied, motivation for specific behavior was emerged. Especially when individual enjoy the excise, he or she is likely to motivate to do it. Joy or fun in exercise made one pursue do that exercise. Middle-aged women who exercise over 6 month said they adhered experience because the

exercise be felt as a wonderful, pure joy[8]. They wanted be pleased by keeping engage exercise[9]. Because joy or fun is a inborn need in SDT. Pursuing fun can result in exercise adherence. And that regular exercise resulted in health outcome such as weight loss, confidence, self-respect, etc[9]. Until now, exercise intervention in nursing had been planned for chronic patients who had to long-term exercise. Nurse in the research usually focused on health outcome rather than the process to achieve health[10]. It was a kind of extrinsic motivation in SDT. As extrinsic motivation increases, intrinsic motivation decreases, so it was easier to stop exercise if someone emphasized that one have to exercise[7]. After nurse's exercise program was over, even though one should keep one's own exercise. But few studies of nursing had been interested in this point. According to the theory of self-determination, the innate need and motivation of the human being is important to maintain certain behaviors such as exercise. People with chronic illnesses can recover and maintain their health through voluntary long-term exercise. However, even if they know that exercise is beneficial to health, it is difficult to practice or keep it. Therefore, this study tried to construct and validate an exercise adherence model based on self - determination theory. Because self - determination theory has focused on human basic needs and innate motives. Therefore, this study sought to find a link to connect the high perception rate that exercise is important and the low exercise participation rate. The results of this study will provide a basis for constructing a theory related to the continuation of health behavior by introducing self - determination theory into nursing science. In addition, it will provide basic data on the development of exercise interventions for nursing clients who need long-term initiative exercise.

## II. Methods

### 1. Participants and Ethics

This study was conducted through approval of Institutional Review Board of S University in Seoul (Approval number; 2013-8). Participants were 215 men and women aged 40 to 60 who exercised for more than 6 months. Data were surveyed by Researcher and research assistant from the sports facilities such as swimming pool, table tennis courts, fitness club in 4 big city of Seoul, Busan, Gwangju and Deajeon in Korea. The survey tool

Table 1. Characteristics of Participants(N=215)

Characteristics	Categories	n(%)	Mean(SD)
Gender	Male	120(55.8)	
	Female	95(44.2)	
Age(yr)	40-44	63(29.3)	48.7(6.0)
	45-49	53(24.7)	
	50-54	56(26.0)	
	55-60	43(20.0)	
Marital state	Married	206(95.8)	
	Not married	9(4.2)	
Education	Middle school	6(2.8)	
	High school	86(40.0)	
	College	123(57.2)	
Perceived economic status	Low	17(7.9)	
	Moderate	172(80.0)	
	High	26(12.1)	
Religion	Yes	112(52.1)	
	No	103(47.9)	
Occupation	Yes	168(78.1)	
	No	47(21.9)	

Table 2. Descriptive statistics of variables (N=215)

Construct	Variables	Mean (SD)	Mini-Maxi	Skewness	Kurtosis
Need					
	Autonomy	4.17(0.76)	2.17-5.00	-0.602	-0.711
	Competence	3.47(0.79)	1.67-5.00	0.121	-0.393
	Relatedness	3.99(0.77)	1.67-5.00	-0.473	-0.527
Social support					
	Emotion	3.62(1.06)	1.00-5.00	-0.712	0.097
	Information	3.43(1.03)	1.00-5.00	-0.462	-0.186
	Tangible	3.45(0.87)	1.00-5.00	-0.354	-0.095
Motivation					
	Ability	3.56(0.82)	1.00-5.00	-0.072	-0.422
	Interest	4.09(0.75)	2.00-5.00	-0.472	-0.763
	Effort	3.83(0.69)	2.25-5.00	0.084	-0.792
Adherence					
	Frequency (per week)	4.39(0.58)	2.44-5.00	-0.360	-0.707
	Duration (months)	3.60(1.17)	3.00-5.00	-0.081	-1.482
	Habit (5 Likert scale)	3.71(0.96)	3.33-5.00	-0.591	-0.061

was a questionnaires consisted of basic psychological needs, intrinsic motivation, social support and exercise adherence. After completing the questionnaire, the participant received a small gift.

## 2. Scales and Data Analysis

This study was conducted through approval of Institutional Review Board of S University in Seoul (Approval number; 2013-8). The data were collected by questionnaire consisting of basic psychological need[11], social support[12], intrinsic motivation[13] and exercise adherence[14]. Social support was revised by adding one item. Exercise adherence was revised by choosing exercise habit from exercise adherence scale[14], by adding exercise frequency and exercise period. Two modified tools were confirmed by confirmatory factor analysis of AMOS. Data was analyzed by SPSS 19.0 and AMOS 20.0. The characteristics of participants and research

variables were analyzed by descriptive statistics, Pearson's correlation. The Fit of model was verified by  $\chi^2$ (CMIN), Normed  $\chi^2$ (CMIN/d.f.), GFI, AGF, NFI and RMSEA.

## 3. Conceptual Framework

Based on the self-determination theory, several research and literature were reviewed. As a result of reviewing literature, we found that intrinsic motivation appears when basic psychological needs are satisfied. Intrinsic motivation was a predisposing factor to adhere certain behaviors. Social support was treated as an important factor in the previous literatures on exercise of middle-aged. Therefore, social support was included as a factor influencing intrinsic motivation. This study provided the theoretical basis for the basic psychological needs and social support as exogenous variables, intrinsic motivation as a mediating variable and exercise adherence as final endogenous variable.

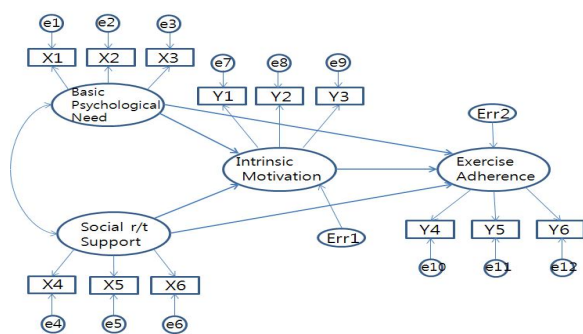


Fig. 1. Conceptual framework

### III. Results

#### 1. Characteristics of Participants

The general characteristics of participants are described in table 1. There were 120 males (55.8%) and 95 females (44.2%). The average age of participants was 48.7years. 206 (95.8%)of participants were married, 123 (57.2%) were college graduate. 112 (52.1%)of participants had religion and 168(78.1%) were had occupation.

#### 2. Descriptive statistics of the measured variables

The sub-factors constituting the constructs were as follows. The frequency of exercise was 4.39, autonomy 4.17, and interest 4,09 among the variables using the 5 - point Likert scale.

#### 3. Effects of Variables in the Model

Causal effects between measured variables were analyzed by covariance structure analysis. In this model,

the basic psychological need directly influenced to intrinsic motivation .606, total effect was .606. Social support directly influenced to intrinsic motivation .340 and total effect was .340. The basic psychological need affected exercise adherence directly .128, indirectly .331, and total effect was .459. Intrinsic motivation direct effect to exercise adherence was .546, and total effect was .546. Social support's indirect effect to exercise adherence was .185 and total effect was .186. In this way, the basic psychological desire did directly effect on the intrinsic motivation, and the intrinsic motivation effected directly to exercise adherence. The strongest influence directly on the exercise adherence of middle-aged was intrinsic motivation.

#### 4. Fit of the Model

Table 4 shows the fitness indices of this study model. The chi-square is 77.664, the GFI is .938, the AGFI is .915, the NFI is .912, the CFI is .941, the mean square error .The square root (RMSEA) was .041. Therefore, this study model satisfied the fit standard of the structural model equation.

### IV. Discussion

This model of exercise adherence in middle-aged based on self-determination theory met the standard of structural equation model. The basic psychological needs and social supports directly influenced intrinsic

Table 3. Effect of Variables in the Model

Path	Direct Effect	Indirect Effect	Total Effect
Basic Psychological Need → Intrinsic Motivation	.606**	-	.606
Social Support → Intrinsic Motivation	.340**	-	.340
Basic Psychological Need → Exercise Adherence	.128**	.331**	.459
Social Support → Exercise Adherence	.001	.185**	.186
Intrinsic Motivation → Exercise Adherence	.546**	-	.546

\*\* p<.01

Table 4. Fit of the Model

$\chi^2$	p	d.f.	Normed $\chi^2$	GFI	AGFI	RMSEA	CFI	NFI
77.664	.001	28	2.773	.938	.915	.041	.941	.912

GFI: Goodness of fit index, AGFI: Adjusted goodness of fit index, RMSEA: Root mean square error of approximation, CFI : Comparative fit index, NFI: Normal fit index

motivation. Basic psychological needs and intrinsic motivation directly affected the exercise adherence, which was similar context as the positive emotions of leisure participants had related their behavioral commitment[15]. In middle-aged, rather than a professional athlete, ordinary people's adherence to sport was supported by fun and pleasure [16, 17]. The enjoyment or pleasure experienced by ordinary people during exercise can be regarded as internal motivation. In this study, middle-aged intrinsic motivation directly affected the duration of exercise. Middle-aged were ordinary people, not exercise experts. Middle-age intrinsic motivation influenced the adherence of exercise. Thus, the relationship between intrinsic motivation and exercise adherence supported previous studies. Intrinsic motivation meant fun or pleasure in exercise. This is distinguished from the way in which cancer patients were monitored and encouraged by nurse for continuing exercise in the home[10]. This is because cancer patients should continue to exercise after termination of nursing intervention. Nurse should make them experience intrinsic motivation. It means if one enjoyed exercise, one do one's best to get joy, doing this repeat, one do adhere to exercise and can get final health outcome. In this study, exercise-related social support indirectly affected the duration of exercise through internal motivation. This was somewhat different from the results of the study that exercise behaviors in urban middle - aged women should include social support, such as an athletic environment and an exercise partner[18]. However, in the middle age, social support was a influencing factor to the exercise adherence by increasing intrinsic motivation. In middle-aged women, the pleasure of exercise was the power to sustain exercise while changing type or time of exercise[9]. In this study, we confirmed that both the internal experience and the environmental factors were important factors of exercise adherence in middle aged men and women. The fact that non-professional exercisers were engaged in exercise pursues fun and pleasure as a intrinsic motivation rather than reward or punishment as a external motivation[9, 17-18]. Until now, nursing studies related to physical activity had little interest in exercise adherence. Social support was an important factor as the previous study[19].

The middle age, which overestimates physical activity, maintained good health status compared to those who did

not[20]. Since middle-aged exercise is essential for health, this study revealed a pathway for the middle-aged to continue the exercise.

This study model that combined social support and self - determination factors met the model fit criteria. If the patient's psychological needs and intrinsic motivation are applied to nursing in a long-term exercise plan based on self-determination theory, health will be achieved more efficiently.

## V. Conclusion

This study has provided theoretical basis for achieving health by constructing and verifying a model in which middle-aged people continue their exercise. Based on the theory of self - determination, this study synthesized the psychological needs and intrinsic motivation and the social support that is important in nursing. In self-determination theory, intrinsic motivation, such as interest, is important in sustaining certain behaviors. Also, the emphasis is on the basic psychological desire for achievement, autonomy, and relationship. These self-deterministic factors were introduced into nursing and the model was constructed by identifying the continuation pathways of exercise. This study implies that the introduction of self - determination theory into nursing has provided a basis for applying it to nursing subjects who are essential for long - term exercise. Especially when it comes to health, it does not mean that you have to continue exercising. The basic psychological desire and intrinsic motivation were shown to have influenced the continuity of certain behaviors such as exercise. The results of this study can be applied to nursing research or clinical setting considering the basic psychological needs and intrinsic motivation of nursing clients. The results will provide a evidence for nursing intervention and further research. It will also help planning program by nurse for chronic patients who need to do long-term exercise by themselves. In order to generalize the research results, data were collected from four major cities in Korea, but they were limited in the generalization of research results because they were convenient extraction.

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