

Variables influencing older people's participation in exercise

- Based on Transtheoretical Model (TM) -

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I . Introduction

1. Necessity of Study

The size of the old population is now dramatically expanding in Korea. Thanks to the extension of average life span and birth rate decrease, people aged 65 or over is expected to be increased from 7.1% in 2000 to 8.7% in 2005 in percentage point and to 10.0% in 2010 and 13.2% in 2020(2000, Korea National Statistical Office).

According to a report by Korea National Statistical Office in 1998, only 18.1% of domestic old people, aged 60 or over, were regularly participating in exercises. In foreign countries, reportedly, only 30% of people who

were 65 years old or over were found regularly exercising(USDHHS, 1996). There was another report that more than 50% of old people quit exercise 3 to 6 months after beginning it, suggesting that it is very difficult to induce old people to participate in exercises and even more difficult to make the people keep the participation(Lee, 1997; Hwang, 1999). Resnick and Spellberg (2000) recommended exercise as a desirable way of promoting old people's health. Daley(2000) suggested that exercise was one of the behavioral strategies of health promotion very useful to the old population because it could improve the flexibility of joints and strengthen muscle power, although it was begun in later life. Some sports medicine

professionals reported that exercise might prevent and even treat geriatric diseases (Song, 1994).

Now in Korea under a rapid movement into the aging society, little participation by old people in exercise is one of the biggest challenges to the nursing profession (Kim, 1994). Nursing intervention developments are critical and urgent for inducing the people to participate in and maintain exercises (Kim & Kim, 2000).

Most of the studies on exercise related to the aged class in the field of nursing science have focused on the clarification of effects by exercise programs, containing muscle power strengthening (Kim, 1994) and walk training (Shin, 1997), on old people's health. Currently, a major problem with exercise related to old people lies in the facts that in most cases, the people do not regularly participate in exercise or do not have any intent of such participation and that they often quit exercise halfway (Grimely, Riley, Bellis & Prochaska, 1993; Kwon, 2001). In future, studies about old people's exercise should provide various ways of inducing the people to practice and maintain exercise and preventing the maintenance rather than just predict effects of exercise on their health.

Unlike models explaining reasons of health behaviors (ex. Health Belief Model, Health Promotion Model), Transtheoretical Model (TM) is a process model that describes

how to learn health behaviors and stop behaviors harmful to health (Prochaska & DiClemente, 1983, 1986). For the past two decades, it has been applied to studies designed to induce various changes in health behaviors (Prochaska & DiClemente, 1983, 1985; Prochaska et al., 1992, 1994; Prochaska & Velicer, 1997). TM initially accepted the concepts of 'stage of change' and 'process of change' and later integrated those of 'decision making', based on social cognitive theory, and 'self-efficacy' (Prochaska, DiClemente & Norcross, 1992). As one of the theories useful to explain dynamic processes of employing, maintaining and quitting exercises (Marcus et al., 1992, 1997), the model would provide frameworks of nursing intervention guidelines or programs for attracting old people into exercise.

Thus this study is basically designed to develop stage protocols that show cognitive and behavioral aspects experienced by old people during exercises. Based on Transtheoretical Model (TM), in relation, the study tries to identify differences in processes of change, decision making, and self-efficacy by exercise behavioral stages and determine variables significantly affecting the people's participation in exercises.

2. Purpose of Study

The purpose of this study can be interpreted in the following objectives.

- 1) To identify exercise behavioral stages of change in part of old people
- 2) To verify differences in processes of change, decision makings and self-efficacy by the stage of change
- 3) To determine variables affecting old people's participation in exercises.

II. Methodology

1. Design

This study is a cross-sectional research which is designed to identify differences in TM constructs such as process of change, decision making and self-efficacy among old people according to their exercise behavioral stages and clarify significant variables affecting the people's exercise participation.

2. Subjects & Data Collection

The subjects of this study included 299 people aged 65 or over who were residents of G and S districts in Busan Metropolitan City. They were selected through purposive quota sampling at colleges and centers for old people and homes in order that they could be evenly distributed over stages of pre-contemplation, contemplation, preparation, action and maintenance.

Data for this study were collected during the period from June 4 to 11, 2002. For the collection, the purpose of this study was

explained to old people from colleges and centers for the aged. Among the people, those who agreed to participate in this study were asked to answer question items read directly by assistant researchers. A few of the study participants from the colleges read through and filled in questionnaire forms in person. Some data deemed as insufficient were supplemented through revisits to the subjects.

3. Measures

1) Exercise Behavioral Stages of Change

Determined according to the extent and intent of exercise participation, exercise behavioral stages of change consist of 'pre-contemplation', 'contemplation', 'preparation', 'action' and 'maintenance' stages (Prochaska & DiClemente, 1983).

Exercise stages of change were identified using a measurement device developed by Burbank, Padula and Nigg(2000). Consisting of total four question items, the device asks respondents to say 'Yes' or 'No' in regard to whether they are currently participating in exercises or not and whether they have any intent of future exercise participation. In this study, 'pre-contemplation' is referred to as a status that one does not participate in exercises at the moment and has no intent of such participation within 6 months. 'Contemplation' means a situation that one intends to start exercise within 6 months, not

in near future(within 30 days), though participating in no exercises presently. 'Preparation' indicates a condition that one does not engage in exercise at the moment, but intends to start a regular exercise within 30 days. 'Action' is herein referred to as a situation that one has been regularly participating in exercises for shorter than 6 months. Finally, 'maintenance' is a status that one has been regularly participating in exercises for longer than 6 months.

2) Processes of Change

The processes of change are classified into those of cognitive and behavioral changes. The process of cognitive change involves five dimensions such as conscious raising, self-reevaluation, dramatic relief, environmental reevaluation and social liberation while that of behavioral change, opposite condition formation, supportive relationship, stimulus control, reinforcing management and self-liberation(Prochaska, Velicer, DiClemente, & Fava, 1988).

Processes of change were identified using a measurement device originally developed by Nigg, Norman, Rossi and Benisovich (1999) and translated by Kim(2000). The device contained total 30 question items, or 3 for each of the 10 dimensions of change process. Each of the question items was responded using Likert's scale whose scores range from one(1) indicating 'absolutely not'

to four(4), 'absolutely yes'. The high average of scores obtained on the scale indicates that its relevant dimension of change process is very frequently used. When the measurement device was initially developed by Nigg et al.(1999), Cronbach's α was .86. The coefficient was .93 in a study by Kim(2002) using the device. In this study, Cronbach alpha coefficients were .69 to .89 for dimensions of cognitive change process and .76 to .85 for those of behavioral change process, overallly .90 and .89, respectively.

3) Decision Makings related to Exercise

Decision makings related to exercise were measured to determine the pros and cons of exercise perceived by old individuals. The Tool of decision making was developed by Lee and Chung(2001) who worked with old people of Korea(n=249). The Tool contained totaled 21 question items, consisting of 13 for perceived factors of the benefits of exercise performance and 8 for those of the obstacles of the performance. Each of the question items was responded using Likert's scale whose scores range from one(1) indicating 'absolutely not' to four(4), 'absolutely yes'. The high average of scores obtained on the scale indicates that its relevant factor of exercise benefit or obstacle is high perceived. When the measurement device was first developed by Lee and Chung(2001), those 13 and 8 question items were determined through

factor analysis as .67 to .79 and .47 to .74, respectively, in the range of factor loading, demonstrating the construct validity of the device, In relation, Cronbach's alpha coefficients were .93 and .73, respectively at that time and .93 and .81 in this study.

4) Self-efficacy

Self-efficacy means confidence in one's own ability of doing an action giving a certain outcome (Bandura, 1977). Self-efficacy is herein referred to as confidence in one's own ability of keeping on exercise in any situation. In this study, self-efficacy was evaluated using a Tool developed by Marcus, Selby, Niatra and Rossi (1992) and translated by Lee and Chung (2001). The Tool contained totaled 5 question items, each of which was responded using Likert's scale whose scores range from one (1) indicating 'not confident at all' to five (5), 'too very confident'. That such scores are high means a high self-efficacy in exercise maintenance. Cronbach's alpha coefficient was .82 at the time of the device development mentioned above, and .90 in this study.

4. Analysis

Data as collected were statistically analyzed using SPSS-Win 10.0.

1) Demographic characteristics of the subjects were provided in terms of

frequency and percentage point.

- 2) Differences in processes of change, decision makings and self-efficacies among old people in accordance with their exercise behavioral stages were verified using ANOVA and Bonfferroni-test.
- 3) Variables significantly affecting old people's participation in exercises were determined through Logistic Regression.

III. Results

1. Demographic Characteristics

Out of the total 299 old people sampled here, 43.8% (n=131) were selected from colleges for the aged, followed by 30.4% (91) from centers for old people and 25.8% (77) from homes. Old women accounted for 80.3% (240) of the total subjects and old men, 19.7% (59). Out of the total old people surveyed here, 30.4% (191) were aged between 75 and 79, followed by 28.1% (84) between 70 and 74, 17.7% (53) between 80 and 85 and 14.4% (43) between 65 and 69. Most of the old people were 'elementary school graduates', occupying 35.5% (n=106) of the total subjects, followed by 'uneducated', 31.1% (99). Out of the total subjects, 45.5% (n=136) were living alone and the remainder 54.5% with spouses or married and

unmarried children. 51.5%(153) among the total 299 old people responded they were given a moderate allowance and 29.1%(87), an abundant one.

2. Characteristics of the Stages of Exercise by Old People

The distribution of the stages of exercise by old people is shown in [Table 1]. Most of the old people surveyed in this study, occupying 32.1%(n=96) were under the stage of maintenance, followed by 25.8%(77) under the stage of pre-contemplation, 12.7%(38), the stage of contemplation, 17.4%(52), that of preparation and 12.0%(36), action. Out of the total subjects, 44.1%(n=132) were actually practicing exercises.

3. Variables Affecting the Determination of Exercise Behavioral Stages

- 1) Differences in experiential processes of change in accordance with Stages of Change

As shown in [Table 2-1] and [Figure 1], such dimensions of the cognitive change

process as conscious raising, environmental reevaluation, self-reevaluation, dramatic relief and social liberation were found significantly different according to exercise stages. The five dimensions were lowest in average at the stage of pre-contemplation and highest at that of action. Such value at the stage of maintenance was somewhat lower than at that of action. In the post hoc test, conscious raising, self-reevaluation and dramatic relief were found different between at the stages of preparation and action, while environmental reevaluation and social liberation between at the stages of preparation and action and between at those of action and maintenance.

As shown in [Table 2-2] and [Figure 2], dimensions of the behavioral change process such as opposite condition formation, supportive relationship, stimulus control, reinforcing management and self-liberation were significantly different among old people according to their current exercise stages. The five dimensions were lowest in average at the stage of pre-contemplation and highest at that

Table 1. Characteristics of exercise stage of change

		(N=299)	
		N	(%)
exercise stage of change	pre-contemplation	77	25.8
	contemplation	38	12.7
	preparation	52	17.4
	action	36	12.0
	maintenance	96	32.1
total		299	100.0

Table 2-1. Differences of experiential process of change by exercise stage of change (N=299)

process	stage	stage						post hoc test
		PC	C	P	A	M	F	
experiential	conscious raising	1.77 (0.63)	1.70 (0.69)	1.97 (0.64)	2.31 (0.74)	2.32 (0.81)	9.63***	$\overline{C \ PC \ P} \quad \overline{M \ A}$
	environmental-reevaluation	2.50 (0.72)	2.60 (0.61)	2.85 (0.68)	3.45 (0.46)	3.10 (0.66)	16.83***	$\overline{PC \ C \ P} \quad \overline{M \ A}$
	self-reevaluation	2.56 (0.62)	2.60 (0.68)	2.87 (0.67)	3.35 (0.54)	3.25 (0.66)	17.85***	$\overline{PC \ C \ P} \quad \overline{M \ A}$
	dramatic-relief	2.34 (0.73)	2.56 (0.79)	2.76 (0.81)	3.34 (0.66)	3.24 (0.60)	22.41***	$\overline{PC \ C \ P} \quad \overline{M \ A}$
	social liberation	2.24 (0.61)	2.44 (0.55)	2.66 (0.74)	3.20 (0.70)	2.95 (0.68)	18.58***	$\overline{PC \ C \ P} \quad \overline{M \ A}$

PC: pre-contemplation, C: contemplation, P: preparation, A: action, M: maintenance ***p<.001

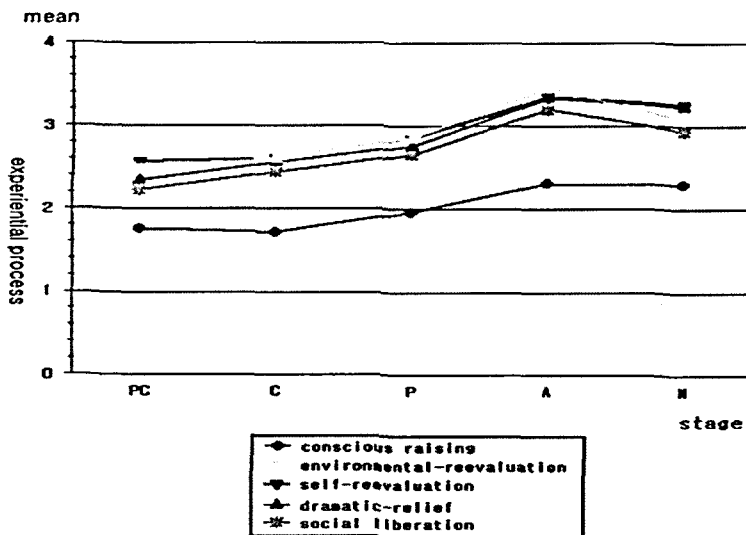


Figure 1. Transition of Experiential processes of change

Table 2-2. Differences of Behavioral Process of change by exercise stage of change

(N=299)

process	stage	stage							post hoc test				
		PC	C	P	A	M	F		PC	C	P	M	A
behavioral	counter-conditioning	1.86 (0.67)	2.09 (0.58)	2.32 (0.71)	2.77 (0.63)	2.74 (0.69)	22.54***	————— PC C P M A					
	help-relationship	1.93 (0.70)	2.19 (0.75)	2.07 (0.78)	2.31 (0.84)	2.33 (0.76)	3.16*	————— PC P C A M					
	reinforcement-management	2.51 (0.75)	2.56 (0.75)	2.91 (0.74)	3.44 (0.50)	3.27 (0.48)	22.98***	————— PC C P M A					
	self-liberation	2.12 (0.76)	2.42 (0.68)	2.74 (0.74)	3.31 (0.55)	3.19 (0.61)	35.29***	————— PC C P M A					
	stimulus-control	1.45 (0.58)	1.76 (0.75)	1.87 (0.90)	2.70 (0.82)	2.38 (0.90)	22.08***	————— PC C P M A					

PC: pre-contemplation, C: contemplation, P: preparation, A: action, M: maintenance *p<.05 ***p<.001

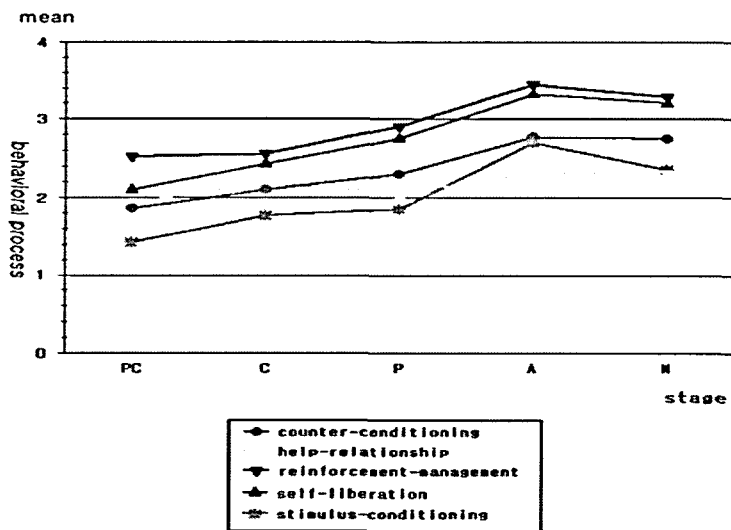


Figure 2. Transition of Behavioral processes of change

of action. The value at the stage of maintenance were somewhat smaller than at that of action. In the post hoc test, opposite condition formation were different between at the stages of pre-contemplation and contemplation and between at those of preparation and action. It was also found in the test that reinforcing management were different between at the stages of contemplation and preparation and between at those of preparation and action, while self-liberation between at those of pre-contemplation and contemplation, between at those of contemplation and preparation and between preparation and action. Finally the test showed that stimulus control were different between at the stages of pre-contemplation and contemplation, preparation and action, and action and maintenance.

2) Differences in decision making and self-efficacy by the stages of change (N=299)

[Table 3] shows decision makings and

self-efficacies depending on exercise stages. Exercise benefit and obstacle evaluations and self-efficacy were all significantly different in accordance with exercise stages. In terms of average, exercise benefit evaluation and perceived subjective health were all lowest at the stage of pre-contemplation and highest at that of maintenance. Exercise obstacle evaluation were highest in average at the stage of pre-contemplation, and became lowest at that of maintenance as exercise stages were proceeded. Self-efficacy was lowest in average at the stage of pre-contemplation, and gradually raised as exercise stages were proceeded, and became highest at that of action. It was somewhat lower at the stage of maintenance than at that of action, but with no statistically significant difference. It was found in the post hoc test that exercise benefit evaluation was different between at the stages of contemplation and action and between at those of action and maintenance, that exercise obstacle evaluation and perceived subjective health were all different between at the stages

Table 3. Differences in decision making and self-efficacy by exercise stage of changes

(N=299)

decisional balances	stage						F	post hoc test			
	PC	C	P	A	M						
benefits of exercise	2.40 (0.56)	2.64 (0.49)	2.84 (0.55)	3.28 (0.47)	3.08 (0.54)	24.36***	\overline{PC}	\overline{C}	\overline{P}	\overline{M}	\overline{A}
barriers of exercise	2.39 (0.51)	2.35 (0.74)	2.25 (0.54)	1.99 (0.62)	1.88 (0.49)	10.72***	\overline{M}	\overline{A}	\overline{P}	\overline{C}	\overline{PC}
self-efficacy	1.80 (0.61)	2.08 (0.51)	2.51 (0.57)	3.01 (0.49)	2.96 (0.64)	49.08***	\overline{PC}	\overline{C}	\overline{P}	\overline{M}	\overline{A}

PC: pre-contemplation, C: contemplation, P: preparation, A: action, M: maintenance ***p<.001

of action and maintenance and that self-efficacy was different between at the stages of pre-contemplation and contemplation, between at those of contemplation and preparation and between preparation and action.

4. Variables Affecting Participation or Non-Participation in Exercise

In this study, participation or non-participation in exercise is the response variable. Here, those old people who were under the stages of 'action' and 'maintenance' were classified as 'the group of exercise, represented by 'Y=1', while those under the stages of pre-contemplation, contemplation and preparation, the group of non-exercise, represented by 'Y=0'

Variables influential to exercise participation, totaled 13 in number, consisted of 10 dimensions of cognitive and behavioral change processes, 2 factors of decision makings evaluation and self-efficacy. To discriminate between those who were and

were not currently participating in exercises, this study used Logistic Regression Analysis, not Discriminant Analysis because the former analysis does not necessitate an assumption required by the latter that independent variables are under multivariate normal distribution and variance and covariance matrices each of which is comprised by dependent variables are identical with each other.

As shown in [Table 4], variables that discriminate between participants and non-participants in exercise include self-reevaluation, reinforcing management, cons and self-efficacy. Increase by 1 in value in self-efficacy leads to increase by 5.885 times in the probability of exercise participation. If self-reevaluation improves by 1 in value, the probability of such participation increases by 2.627 times. Such probability multiplies by 2.094 times as reinforcing management increases by 1 in value. If exercise obstacle increases by 1 in value, the probability of exercise participation

Table 4. Variables discriminating between participation and non-participation in exercises

(N=299)

Dependent Variables	Independent Variables	β	Exp(B) OR	p
exercise no-exercise	self-reevaluation	0.966	2.627	0.000
	Reinforce Management	0.739	2.094	0.000
	Cons	-1.400	0.247	0.000
	self-efficacy	1.772	5.885	0.000
	intercept	-6.108	0.002	

goes down by 0.247 times. Thus if variables that discriminate between participation and non-participation in exercise such as self-reevaluation, reinforcing management, cons and self-efficacy are fully considered in designing nursing interventions for inducing old people to become exercise participants, it would provide guidelines for nursing intervention programs as appropriate for the people's exercise stages.

IV. Discussion

As not a longitudinal study, this study was limited in tracking and observing processes of change, decision-making, self-efficacy and subjective health cognition in accordance with exercise stages of change. But the study allowed this researcher to determine mean differences among cognitive and behavioral factors in accordance to the stages. Findings from this study demonstrates that people's exercise-related cognitive and behavioral changes are determinants to whether they would participate in exercise or not.

This researcher analyzed the subjects' exercise stages of change to find that out of total 132 older people who currently practice exercise, 96 have kept exercise for more than 6 months and as many as 77 have no intent of exercise. This suggests the necessity of considering whether clients are current

exercise participants or not and whether they have the very intent of exercise participation or not in applying exercise nursing interventions. Marcus et. al.(1997) reported that stages of exercise under Trans -theoretical Model vary according to types of health behavior. This is supported by this study and previous studies. Whang(1999) surveyed patients(N=176) with 2nd-type diabetes, who were outpatients of a general patients, in terms of their exercise stages of change and found that out of the surveyed patients, 6.4% were in the stage of non-exercise, 22.9%, the stage of exercise behavior and 67.3%, that of exercise maintenance which meant keeping exercise for more than 6 months. That is, 90.2% of the surveyed belonged to exercise behavior and exercise maintenance stages. Through the survey of middle-aged women's exercise stages of changes in relation to their vaginoperineal muscle, Lim(1999) found that 38.3% of the surveyed women were in the stage of pre-exercise planning, 36%, the stage of exercise planning, 22%, that of exercise preparation, 3%, exercise behavior and 2.5%, exercise maintenance. In sum, 74.3% of the women were in the stages of pre-exercise planning and exercise planning and 5.5%, those of exercise behavior and exercise maintenance. Jun et. al.(2000) investigated such stages of people aged 60 or over(N=191) to find that out of the total subjects, 26.1, 3.6, 27.1, 2 and 40.8% were in pre-exercise

planning, exercise planning, exercise preparation, exercise behavior and exercise maintenance stages, respectively. This is similar to findings from this study.

Process of change is used as a criterion to measure how often people think and physically and emotionally experience behavioral changes(Prochaska & Diclemente, 1983). Cognitive and behavioral factors that are significantly different according to stages of behavioral change were analyzed here to find that most of the factors show significant mean differences in the stages of exercise preparation and exercise behavior. This suggests that people who now participate in exercise use more cognitive and behavioral strategies than those who do not participate now. A survey by Jun et al.(2000) found that Korean older people tend not to use behavioral strategies for the control and evaluate of exercise-related situations such as stimulus control, self-reevaluation and reinforce management. But this study shows that older people of this nation use 13 cognitive and behavioral strategies equally. Differences between two studies should be resolved through more profound studies about such strategies in relation to exercise practice. Prochaska et al.(1988) who studied smoking behaviors reported that the process of cognitive change was more frequently used by people who were in the early change of smoking behavior, while that of behavioral

change by people who were in the later change of such behavior. Meanwhile, this study showed that both of the two processes were increasingly used by older people as the people proceeded from the stage of pre-exercise planning to that of exercise behavior. This supports Prochaska and Velicer(1997) who claimed that the pattern of change process for inducing or promoting healthy behaviors would be different from that of such process for preventing unhealthy behaviors.

Third, the probability of exercise participation increases by 5 times when self-efficacy for the participation is high, by 3 times when self-reevaluation, representing belief in exercise performance is frequently conducted and by 2 times when behaviors of reinforce management are frequently done. In contrast, the possibility decreases by 0.2 times when motor disturbance is highly recognized. These results suggest that self-efficacy is a cognitive factor not only greatly contributing to exercise participation, but also interfering with the participation. The results also show that self-liberation and reinforce management which encourage clients to have belief in or actually practice exercise become behavioral strategies for making the clients participate in exercise. This is similar to a study of older people(N=89) by Kwon(2001). Nursing intervention programs for inducing older people to practice exercise should be planned

according to the people's individual exercise stages of change. Such programs could be more effectively guided and implemented if factors, which are used to whether clients would begin exercise or not, such as self-reevaluation, reinforce management, Cons and self-efficacy are considered.

Because they were based on purposive convenience sampling not random sampling, findings from this study may be different with the actual distribution of Korean older people's exercise stages of change. So the researcher would suggest the development of representative studies based on random sampling whose results could be standards of health statistics clearly providing such exercise stages as foresaid.

V. Conclusion

This study is a cross-sectional research designed to determine variables affecting exercise participation by old people, based on Transtheoretical Model(TM). The study made a questionnaire survey of 299 old people from colleges and centers for the aged and homes between June 4 to 11, 2002. Data from the survey were statistically analyzed using SPSS/WIN 10.0 to obtain the following results.

First, 44% of the total subjects were regularly participating in exercises. 73% of

the regularly exercising old people had been participating in exercises for more than 6 months, belonging to the stage of maintenance. 56% of the total subjects were not exercise participants, 46% of whom had no intent of participating in exercises.

Second, processes of change, decision makings and self-efficacies were significantly different among old people according to their exercise stages. Self-reevaluation, reinforcing management, self-efficacy and cons were found variables discriminating between participation and non-participation in exercises.

These results of this study could be brought into the following conclusion. First, nursing interventions for inducing old people to participate in exercises require the assessment of the people's current stage of exercise. Then strategies of nursing intervention should be established appropriately for such stages. Second, exercise participation by old people could be better induced through strategies promoting self-reevaluation, reinforcing management and self-efficacy and removing obstacles to the participation.

There may be differences in the distribution of exercise stages between the subjects surveyed here and the total old population of this nation because this study was carried out based on purposive quota sampling not on random sampling. In future, similar studies should be based on random

sampling, which could be developed into statistical health indicators representing the situation of exercise participation by old people in Korea.

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ABSTRACT

The purpose of this study is to identify differences in processes of change, decision making, and self-efficacy by exercise behavioral stages and determine variables significantly affecting the older people's participation in exercises. The subjects of this study included 299 people aged 65 or over who were residents of G and S districts in Busan Metropolitan City. They were selected through purposive quota sampling at colleges and centers for old people and homes in order that they could be evenly distributed over stages of pre-contemplation, contemplation, preparation, action and maintenance. Data were analyzed using descriptive, ANOVA, Logistic Regression. Variables that discriminate between participants and non-participants in exercise include self-reevaluation, reinforcing management, cons and self-efficacy. Thus if variables that discriminate between participation and non-participation in exercise such as self-reevaluation, reinforcing management, cons and self-efficacy are fully considered in designing nursing interventions for inducing old people to become exercise participants, it would provide guidelines for nursing intervention programs as appropriate for the people's exercise stages.

Key Words : Transtheoretical Model, exercise, older people