

## Preliminary Analysis for Predicting Changes in Pain and Depression after Implementing the Rheumatoid Health Promotion Program

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### Abstract

This study was performed to evaluate the effect of 7-week comprehensive health promotion program for RA patients (CHPPRA) on changes in pain and depression. In addition, it was also examined that this effect was generated by changes in patients' health promoting strategies (positive self-image, positive thinking, problem solving, communication, pain management, stress management, exercise, and knowledge about RA) learned through CHPPRA. Twenty-eight out-patients of RA clinic in a university hospital participated for this study. The results are as follows.

Changes in exercise, self-concept, positive thinking, problem solving, depression, and pain management were significant predictors to explain relieving pain level. Since all of these variables had positive standardized beta weights ( $\beta$ s), it can be interpreted that increasing level of these health promoting strategies may induce pain improvement.

Changes in positive thinking, communication skill, exercise, self-concept, pain management, and knowledge about the disease were significant predictors to explain positive change in depression. Since all of the significant variables except the change in knowledge about the disease had positive standardized beta weights ( $\beta$ s), it can be interpreted that increasing level of these health promoting strategies may induce improving depression level. However, our results showed that the higher level of the knowledge about the disease was, the worse depression was.

**Key words :** *Health promotion, Rheumatoid arthritis, Health promoting strategies, Nursing intervention, Health education*

### Introduction

The ultimate goals of treatment and management for rheumatoid arthritis (RA) are relieving pain, preserving function, and improving psychological well-being. In the process of managing RA, the role of patients is as important as one of health professionals, especially in the

aspect of adjusting medication and their lifestyle.

It has been considered that the health promotion program is beneficial for helping patients to cope with their diseases. Especially, RA patients can make the right decision related to compliance of treatment regime and also can attain the health promoting strategies through the health education. Eventually, such a program

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leads patients to the better health status by reducing pain and functional disability, and improving psychological well-being.

Lorig et al. (1987) emphasized that the most successful intervention program for arthritis was the one which focused on the daily routine strategies related to exercise, coping, self-efficacy and problem solving. Many researchers showed that the health promotion program for arthritis can make changes in patient's knowledge related to illness as well as application methods of the health promoting strategies (Vignos, Parker, & Thompson 1976; Lorig, et al., 1985; Knudson, Spiegel, & Furst, 1981). In addition, almost all of the educated subjects demonstrated changes in the knowledge and 2/3 of subjects demonstrated changes in health promoting strategies and health status. In the case of the intervention programs for the chronic disease, behavioral approaches produced a better outcome as compared with those provided information only about disease (Mazzuca, 1982).

One of the authors (Oh and Kim, 1999; Oh et al., 2000) developed a comprehensive health promotion program for RA (CHPPRA) and examined whether the CHPPRA improved the patients' perceived pain, depression, and functional disability. The CHPPRA was based on the need assessment which established by interviewing 153 out-patients diagnosed as RA. However, it has not been studied yet that what kinds of health promoting strategies in CHPPRA affect on pain and depression specifically.

Therefore, this study was performed to evaluate that how much and which outcome variables (pain and depression) could be explained by individual health promoting strategies (positive self-concept, positive thinking, problem solving, communication, pain management, stress management, exercise, and knowledge related to RA) after accomplishing 7-week comprehensive health promotion program for RA patients. This study is a preliminary analysis to identify strategies which are significant to enhance patients' health status (pain and depression). Based on the results of this study, the CHPPRA will be re-established focused on those significant strategies.

## Definitions

- 1) Comprehensive Health Promotion Program for RA (CHPPRA) : The CHPPRA is a program designed to enhance health promoting strategies. In this study, this program includes the following strategies: the knowledge related to arthritis; positive self-concept; positive thinking; problem solving; pain management skill; stress management skill; communication skill; exercise.
- 2) Pain : In this study, pain represents the level of pain which perceived by the patient. The level of pain was measured by pain scale modified by the researcher.
- 3) Depression : Depression can be defined as patients' maladaptive emotional state. In this study, depression was measured by modified CES-D Scale (Radloff, 1977).
- 4) Positive Self-concept : It can be defined as the positive confidence about self. In this study, it was measured by positive self-concept scale established by CHAPPRA developers.
- 5) Positive Thinking : It is a logical thinking strategy that leads to adaptive behaviors. In this study, it was measured by positive thinking scale established by CHAPPRA developers.
- 6) Problem Solving : It is a strategy that helps individuals to achieve their own goal by identifying possible solutions and eventually selecting a better choice. In this study, it was measured by problem solving scale established by the one of CHPPRA developers.
- 7) Pain Management : It is a strategy that mediates the patients' perceived pain generated by RA itself. In this study, it was measured by pain management scale established by the one of CHPPRA developers.
- 8) Stress Management : It is a strategy that can be used to overcome harmful effects of stress. In this study, the stress management scale developed by the one of the CHPPRA developers was used to measure this.
- 9) Communication : It is a strategy that can promote positive interpersonal relationships and coping ability. In this study, it was

measured by communication scale which was established by the one of CHPPRA developers.

- 10) Exercise : It can be defined as physical activities that promote patients' physical functions and pain by enhancing muscle strength. In this study it was measured by exercise scale established by the one of CHPPRA developers.
- 11) Knowledge about the RA : It signifies the correct knowledge about the nature of RA such as characteristics, diagnosis, and treatment. In this study, it was measured by the knowledge scale related to RA established by the one of CHPPRA developers.

### Study Limitations

In this study, the intervention was provided to the small group. Therefore, the sample size was not large enough to generalize the results on the population. Besides, unstable estimates of the regression model parameters, inflated R-square value, and low power for the F-test of the linear regression model due to a small sample size might be a problem for interpreting results.

Since the present study used one-group pretest-posttest design of quasi-experimental design, there are intimidations on the internal validity such as history, maturation, statistical regression, and testing effect as well as on the external validity such as population validity. Therefore, this limitation should be considered for interpreting results.

### Literature Review

Patients with arthritis are confronted with a disease whose origin is unknown, cure is unlikely and prognosis is uncertain. There is often frustration with the variability of pain and disability. Each morning patients feel new challenges for controlling pain and disability (Lindroth et al., 1995).

The goals of arthritis intervention program are similar to those of traditional medical care for other chronic disease : to improve function,

relieve pain, enhance psychological wellbeing, maintain satisfactory social interaction, and control disease activity. To achieve those goals, providing interventions which attempt to modify patients' behavior may be more efficacious than providing those that only contain information about an illness (Superio-Cabuslay et al., 1996). Benefits of the intervention program for arthritis simultaneously including increased knowledge and changes of patient's health promoting strategies have been reported (Lindroth et al., 1995).

Mazzuca (1982) also noted that adding a psycho-social strategies to an intervention program significantly increases its effectiveness. This may be due to the simple effects of repetition and reinforcement, known to increase efficacy, but is also likely to be due to the specific contributions of these strategies. Exercise, relaxation skills, and joint protection techniques are major strategies that affect patient health and psychological status (Daltroy and Liang, 1991).

Hirano et al. (1994) reviewed literature related to arthritis patient education, and reported that there are many strategies which are encouraged in arthritis intervention programs. These are patients' activities or actions that are believed to improve overall health status or manage symptoms (pain, fatigue, stress, depression, and functional disability). Note that exercise, relaxation, compliance, and joint protection are included again in such activities or actions.

Through reviewing many intervention programs for arthritis, Tucker & Kirwan (1991) presented more inclusive list of health strategies for RA which can be considered to hold therapeutic value such as knowledge about the illness, exercise skill, joint protection skills, relaxation management, communication skill, problem solving/goal setting, stress management, self-efficacy, self-esteem, etc.

Oh & Kim (1999) developed a comprehensive health promotion program for RA (CHPPRA). The CHPPRA (Kim & Oh, 1998) was based on the need-assessment which established by interviewing 153 RA out-patients and using results from the meta-analysis of studies related to arthritis intervention programs. Results of need-assessment signified that pain, disability,

depression, and role impediment in social domain were the health problems which should be targets of health promotion program. Therefore, the objectives of CHPPRA was established as relieving pain, reducing disability, depression, and role impediment. They also suggested that these objectives could be achieved by following strategies: strategies intended to change cognition, behavior, and environment.

Oh and Kim (1999) included following health promoting strategies in the CHPPRA model: knowledge and efficacy related to the arthritis management, pain management skill, exercise, establishment of positive self-image, enhancement of positive thinking, stress management, skill for problem solving, skill for setting goals, skill for asking help, and skill for communication. In that study, intermediate objectives such as "joint protection and maintenance of pain management behavior", "maintenance of regular exercise", and "promotion of coping skill in psycho-social dimension" were achieved through the improvement of all those strategies. In addition, they suggested that the health status such as reduced physical symptoms and signs, decreased functional disability, decreased depression, and enhanced social role performance was also improved in the process of accomplishing the intermediate objectives.

Oh et al. (2000) examined the effect of the 7-week comprehensive health promotion program on pain, depression, and disability. In that study, 18 patients for the experiment group participated in health promotion program for arthritis, and other 18 patients for the control group did not. According to the results, levels of pain and depression in the experiment group were significantly different from those in control group.

Oh (2000) also demonstrated a positive effect of the 7-week comprehensive health promotion program on the health promoting strategies and consequently patients' health status. In that study, CHPPRA showed having a significant positive effect on the patients' overall health status by improving pain, depression, and functional disability. This improvement in the health status might be achieved by enhancing strategies such as goal setting skill, positive thinking, exercise, and knowledge about the

nature of the disease.

However, Hirano et al. (1994) addressed that although most intervention programs for arthritis include those strategies such as self-care behaviors, pain behaviors, pain management techniques, and stress reduction technique, these variables were measured in relatively few studies. They suggested further studies to clarify mechanisms that made arthritis programs effective or what type of intervention or combination of interventions were most effective.

While many longitudinal studies examined effects of various medical interventions and psychological states on health status, there are very few studies which have tried to manipulate health promoting strategies and to determine the effects of these manipulation on health status (Hirano et al., 1994). It is also noted that the positive changes in health promoting strategies are worth examining more in how they are related to other changes.

## Methods

### 1. Study Design

The one group pretest-posttest design was applied for this study. Baseline measurement for variables were conducted on the first day of intervention. Measurement for final outcome variables, pain and depression, were repeated at the 7th week, just after the program was finished. The evaluation for health promoting strategies was performed on the week after providing each strategy. The design model is as follows :

Experimental group	O1	X	O2
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### 2. Subjects and Sampling Method

#### 1) Subjects

Subjects for this study were 28 outpatients who were diagnosed as a classic or definite RA and visiting regularly RA clinic in a university hospital located in Incheon. The diagnosis was made on the basis of the diagnostic criteria of

**Table 1.** The topic and contents of intervention program

Weeks	Topic (hours)	Contents of intervention
1	Overview (2)	General overview about the program
2	RA management (2)	General knowledge related to RA: The structure of the joint, and symptoms, diagnosis and treatment of RA were informed. Then patients' knowledge level for RA was confirmed. In addition, the alternative therapy for RA was discussed.
3	Pain management (2)	Information about meaning and causes of pain, specific methods to control pain and effects of pain management were discussed. In addition, program operators introduced and demonstrated effective strategies for relieving pain. Subjects were encouraged to practice these strategies, write their experiences in their diaries, and submit the diaries to the program operators.
4	Positive thinking, Positive self-image (2)	Positive thinking : The strategy for the positive thinking was to reconstruct patients' cognition toward reasonable and positive. For this, patients were practiced to define and analyze their automatic thinking occurred in the circumstances of everyday life. Patients were also encouraged to write down subjects related to the positive thinking into their diaries, and submit the diaries to the program operators. Positive self-image : Program operators encouraged each patient to explain his/her strong points after they explained strategies which could develop the positive self-concept. Patients prepared and submitted lists related to positive self-image everyday.
5	Stress management, Problem Solving (2)	Stress management : Program operators explained about physical and emotional responses produced by stress and then demonstrated strategies which could alleviate stress level. Patients were encouraged to practice these strategies and also prepare and submit the stress management diary offered in the CHPPRA booklet. Problem solving : First of all, patients attempted to define problems related to their disease. In addition, patients were practiced to arrange alternative solutions and analyze the advantage and disadvantage of each solutions as well as problems to execute. By doing this, patient could learn to select better choices for problem solving. Patients were also encouraged to write how they applied problem solving technique to their everyday life in the diary offered in the CHPPRA booklet.
6	Goal setting skill, Help asking skill, Communication skill (2)	Goal establishment : Program operators explained that re-establishment of goal was an effective way to accomplish ordinary needs under the limited conditions. How to establish realistic and specific long-term and short-term goals were also demonstrated by operators. Finally patients were encouraged to present their long-term goals and short-term plans to accomplish the long-term goals. Help asking : First of all, patients defined when they need help. Then they were understood about the positive aspect of help asking and made lists of resources for help asking in the patients' diary offered in the CHPPRA booklet. Communication : To understand sound communication strategies, patients attempted to perform the role play using scenarios which could be examples for the good and bad communication. Patients also wrote communication diaries offered in the CHPPRA booklet.
7	Exercise (2)	Advantages and special attentions of exercise were explained to patients. Patients practiced the muscle strengthening exercise and stretching exercise in a circle following the instruction. The exercise diary was wrote and reported.

American Rheumatoid Association by a collaborating rheumatologist.

Twenty-five subjects were female. The mean age was 48 (s.d.=7.50) and the mean number of year from being ill was 3.6 (s.d. =6.45). The mean number of year from being diagnosed as RA was 3.4 (s.d. =4.39). One subject graduated from elementary school, 6 from junior, 14 from senior high, 6 from college, and 1 from beyond college level. Most of subjects except 3 were married, 1 widow, 1 divorcee, and 1 single. Three subjects had a job but rest of them did not have any job.

## 2) Sampling Method

Subjects in this study were participated by volunteering or recommendation of their physicians. Volunteers had informations about this program from the newsletter which was published for arthritis patients by the university hospital. Subjects who had uncontrolled medical problems, communicative problems or disorders, or were illiterate, were excluded. Subjects participated to the program to an end without a single dropout.

## 3. Study Intervention

The program was operated by the CHPPRA developers. All subjects were given a CHPPRA manual and instruction about the overall procedures. The program was conducted over 7 separate sessions during 7 weeks in the hospital setting. Each session held about 2 hours. The teaching methods for CHPPRA were based on the standardized education protocol: group discussion, lecture, practice, the use of contracts and diaries to improve skill compliance, role play, and weekly feedback. Table 1 summarizes topics and contents of the CHPPRA.

## 4. Measurements

### 1) Measurements for Final Outcomes

- (1) Pain : Pain was measured by a scale composed of 4 items. The first item is the Face Scale developed by Andrew & Withey (1976) and modified by researchers. The face scale is graded into 7 visual faces ranged

from happy-smile to unhappy-frown face. Patients can choose one face which reflects their present image of face most appropriately.

The second and third item of the scale are Graphic Rating Scales which measure the level of pain exist at that moment and average level of pain occurred during last 2 or 3 days. The last item of the scale was to measure the average hours of pain occurred during last 2 or 3 days.

Items of the scale were revised after performing pre-test for 40 in-patients with musculoskeletal disease. In this study, the reliability coefficient (Cronbach's alpha) of pain scale was .83 (Table 2) and test-retest reliability was .92 ( $r=.92$ ).

- (2) Depression: Depression was measured by a scale, CED-S (Randloff, 1977) which composed of 9 items. This scale was translated into Korean and modified after performing pre-test for 40 in-patients with musculoskeletal disease. In this study, the Cronbach's alpha represented internal consistency of CED-S was .86 and test-retest reliability was .90 ( $r=.90$ ).

### 2) Measurements for Health Promoting Strategies

In this study, health promotion strategies should be measured to evaluate whether practice of these strategies was promoted by participating intervention program. Therefore, it was required to develop a certain tool to measure health promotion strategies included in this study.

First of all, items for measuring each health promotion strategies were developed on the basis of contents in CHPPRA. To increase the validity of measurement tool, the degree of correspondence of those items to contents of CHPPRA was examined with the content analysis by two faculty members whose major is in nursing. However, the measurement tools for health promotion strategies used in this study are still in the beginning stage and needed for further refinement.

- (1) Positive Self-image : The 7-items Likert type scale was used to measure positive

self-image. The scale was developed on the basis of program contents related to positive self-image. The higher score is, the more positive self-concept is. The Cronbach's  $\alpha$  represented the internal consistency was .74 (Table 2) and test-retest reliability was .86 ( $r=.86$ ).

- (2) Positive Thinking : The 8-items scale was used to measure positive thinking. The scale was composed of 3 dimensions: knowledge, cognition, and skills of positive thinking. Knowledge dimension was measured by true or false type of items, but cognition and skill dimensions were measured by Likert type of items. The scale was developed on the basis of program contents related to positive thinking. The higher score is, the higher level of positive thinking is. The Cronbach's  $\alpha$  represented the internal consistency was .72 and test-retest reliability was .90 ( $r=.90$ ).
- (3) Problem Solving : The 4-items scale was used to measure problem solving. Items of the scale were focused on cognition and skills related to problem solving. The scale also included items related to self-efficacy about her/his own problem solving skills. The Cronbach's  $\alpha$  represented the internal consistency was .75 (Table 2) and test-retest reliability was .88 ( $r=.88$ ).
- (4) Pain Management : The 5-items Likert type scale was used to measure the level of skills and self-efficacy related to pain management. This scale was also developed on the basis of program contents related to pain management. The higher score is, the higher level of pain management is. The Cronbach's  $\alpha$  represented the internal consistency was .75 and test-retest reliability was .92 ( $r=.92$ ).
- (5) Stress Management : The 8-items scale was used to measure the level of knowledge, cognition, skill, and self-efficacy related to the stress management. The scale was developed on the basis of program contents related to stress management. The higher score is, the higher stress level is. The

Cronbach's  $\alpha$  represented the internal consistency was .75 and test-retest reliability was .87 ( $r=.87$ ).

- (6) Communication : The 2-items graphic rating scale was used to measure communication. The higher score is, the higher level of self-efficacy for communication skills is. The Cronbach's  $\alpha$  represented the internal consistency was .98 and the test-retest reliability was .89 ( $r=.89$ ).
- (7) Exercise : The 5-items Likert type of scale was used to measure skills, attitude, and self-efficacy of the exercise. The scale was developed on the basis of program contents related to exercise. The higher score is, the higher level of exercise is. The reliability coefficient (Cronbach's  $\alpha$ ) was .77 (Table 2) and the test-retest reliability was .90 ( $r=.90$ ).
- (8) Knowledge about the disease : The dichotomous scale composed of 16 items was used to measure the knowledge level about the characteristics, diagnosis, and treatment of RA. The higher score is, the higher level of knowledge about RA is. The reliability coefficient (Cronbach's  $\alpha$ ) was .84 and the test-retest reliability was .88 ( $r=.88$ ).

## 5. Data Analysis

Two separated preliminary multiple regression analyses were performed for outcome variable of pain and depression. There were no violations for basic assumptions of multiple regression analyses.

## Results

### 1. Descriptive statistics for major variables

There were positive improvements (ranged from 6.1% to 49.4%) in main variables after CHPPRA intervention (Table 2). The variable which showed the largest improvement after intervention was pain. On the contrary, the variable which showed the smallest improvement after intervention was stress management.

**Table 2.** Descriptive statistics for changes in variables

(n=28)

	Pre mean score (S. D.)	Post mean score (S. D.)	Mean % of change (S. D.)	Cronbach's $\alpha$
Pain	18.11 (10.79)	7.06 (3.35)	+ 49.4 <sup>1</sup> (27.01)	.83
Depression	42.24 (9.74)	41.06 (9.21)	+ 7.8 (6.36)	.86
Exercise	14.13 (2.80)	16.86 (1.19)	+ 25.9 (18.90)	.77
Knowledge	11.33 (1.91)	12.93 (1.16)	+ 16.3 (13.63)	.84
Pain management	19.67 (4.43)	20.27 (3.69)	+ 16.1 (8.99)	.75
Problem solving	71.72 (17.55)	77.92 (20.81)	+ 9.5 (7.10)	.75
Self-image	19.19 (2.92)	19.88 (2.85)	+ 36.4 (20.97)	.74
Stress management	28.27 (4.79)	29.46 (2.88)	+ 6.1 (5.91)	.75
Positive thinking	16.69 (1.19)	18.68 (2.12)	+ 12.0 (9.63)	.72
Communication skill	123.75 (44.40)	131.87 (44.00)	+ 24.0 (8.78)	.98

<sup>1</sup> : '+' means improvement in each variable

## 2. The results of multiple regression to predict changes in pain

In the CHPPRA model, exercise, positive self-concept, positive thinking, problem solving, depression, and pain management were included as predictors for pain change (Table 3). Linear regression model including those predictors to explain the positive change in pain was statistically significant ( $F=15.79$ ,  $p=.009$ ). In addition, about 90% of variance of the positive change in pain (Adjusted  $R^2=.90$ ) was explained by those variables.

All of the variables except stress management were significant predictors: changes in exercise ( $\beta=.68$ ,  $p=.02$ ), self-image ( $\beta=1.10$ ,  $p=.000$ ), positive thinking ( $\beta=1.30$ ,  $p=.000$ ), problem solving ( $\beta=.85$ ,  $p=.001$ ), depression ( $\beta=.71$ ,

$p=.02$ ), and pain management ( $\beta=1.98$ ,  $p=.002$ ). Therefore, these variables except stress management could be included in the model as significant predictors to explain pain change. All of these significant variables showed positive standardized beta weights ( $\beta$ s). This implies that pain can be improved by increasing level of these health promoting strategies (Table 3).

## 3. The results of multiple regression to predict changes in depression

In the CHPPRA model, exercise, positive self-image, positive thinking, problem solving, stress management, communication skill, knowledge about disease, and pain management were included as predictors for depression change (Table 4). Linear regression model including

**Table 3.** Multiple regression for predicting changes in pain

(n=28)

Variables	Standardized beta weight	t	p value	Adjusted $R^2$	F	p value
change in exercise	.68	3.91	.02			
change in self-image	1.10	6.14	.000			
change in positive thinking	1.30	6.09	.000			
change in problem solving	.85	8.00	.001	.90	15.79	.009
change in depression	.71	3.78	.02			
change in pain management	1.98	6.90	.002			

\* outcome variable : changes in pain

\* predictors : change in exercise, self-concept, positive thinking, problem solving, depression, pain management, and stress management



**Table 4.** Multiple regression for predicting the change in depression

(n=28)

Variables	Standardized beta weight	t	p value	Adjusted R <sup>2</sup>	F	p value
change in positive thinking	1.01	7.67	.005	.95	30.49	.009
change in communication skill	.23	3.17	.05			
change in exercise	.92	8.05	.004			
change in self-image	.38	4.45	.02			
change in pain management	1.04	6.99	.006			
change in knowledge	-.41	-5.32	.01			

\* outcome variable : change in depression

\* predictors : change in stress management, positive thinking, communication skill, exercise, self-concept, pain management, knowledge, and problem solving

those predictors to explain the positive change in depression was statistically significant ( $F=15.79$ ,  $p=.009$ ). In addition, the result presented that changes in positive thinking ( $\beta=1.01$ ,  $p=.005$ ), communication skill ( $\beta=.23$ ,  $p=.05$ ), exercise ( $\beta=.92$ ,  $p=.004$ ), self-image ( $\beta=.38$ ,  $p=.02$ ), pain management ( $\beta=1.04$ ,  $p=.006$ ), and knowledge about the disease ( $\beta=-.41$ ,  $p=.01$ ) were significant predictors to explain the positive change in depression. About 95% of variance of the depression change (Adjusted R-square =.90) was explained by these variables (Table 4). However, changes in stress management and problem solving ( $\beta=.11$ ,  $p=.43$ ;  $\beta=.07$ ,  $p=.83$  in order) were not significant predictors to explain depression change.

The standardized beta weights ( $\beta$ s) for significant predictors were positive except one variable (changes in knowledge of disease). This implies that the level of depression can be improved by increasing level of these variables (Table 4). In the case of knowledge about disease, there was a negative relationship between this variable and depression level : the higher level of the knowledge is, the worse depression is.

## Discussions

### 1. Analysis for predicting changes in pain

Our findings implies that pain perception in the

arthritis patients can be improved not only by increasing practice of health promoting strategies such as positive changes in exercise, self-image, positive thinking, problem solving, and pain management, but also by decreasing depression level. Oh et al. (2000) also showed that decreased depression as a result of participating CHPPRA might reduce pain and suggested that improving depression was a significant factor to predict reducing pain.

One of the remarkable things to notice from the results was that practicing psychological strategies such as changes in self-image, positive thinking, and problem solving relieved pain significantly while practicing stress management did not. In the case of self-image, the CHPPRA focused on how did the positive self-image influence one's psychological maturity and which skills were needed to foster the positive self-image. Writing diaries about applying positive self-concept skills to their daily life was given to participants as a homework.

Patients practiced how to think positively. They learned about the automatic thinking which was generated in the process of evaluating instantaneously about situation faced in the circumstances of daily life. They were also informed that how automatic thinking affected their adaptive behaviors and psychological well-being. They practiced to appraise whether their automatic thinking for a particular situation was logical. And they were encouraged to write diaries for the homework. The purpose of

practicing think positively in this study was to reconstruct patients' cognition toward logical and positive. In the process of CHPPRA, the cognitive reconstruction can be generated by reappraisal patients' automatic thinking related to disease and negative feelings produced by symptoms and impediments such as pain and functional disability.

For the problem solving strategy, patients practiced to select better choices to solve their problems. First of all, they practiced clarifying their problems, and then establishing goals which objected to solve their problems. Consequently, they were encouraged to identify possible solutions to achieve those goals and keep writing about utilization of problem solving skills in the diaries.

It can be inferred that the psychological strategies (such as positive changes in self-image, positive thinking, problem solving, and depression) may reduce pain by interacting with other strategies (such as exercise and pain management) which had direct effect on pain. In the present study, the rate of pain was reduced by 49.4% through increasing significant predictors. The most powerful predictor for pain improvement was self-image which showed 36.4% of improvement rate, then positive changes in exercise, pain management, positive thinking, and problem solving were followed in order. Stress management was appeared to be insignificant to predict positive change in pain since it showed only 6% of improvement rate. This implies that participating to CHPPRA did not make much differences in adopting stress management strategies.

Ninety percent of positive pain change can be explained by changes in predictors which included in the present study. Such a high degree of explanation may reflect the overestimation of  $R^2$  due to small sample size with large number of predictors. Since this study was only a preliminary trial, further investigation with larger sample size will be needed. The estimation of parameters may also be unstable due to small sample size with many predictors, too. Therefore, the interpretation for  $\beta$  weights must be done with caution.

## 2. Analysis for predicting changes in depression

Our findings showed that positive changes in depression could be predicted by changes in positive thinking, communication skill, exercise, positive self-concept, pain management, and knowledge about the disease. In the model of CHPPRA, positive changes in pain as a predictor for depression change was excluded since there were already too many predictors and pain was not appeared to have priority as a predictor for depression. However, our results showed that strategies which had direct effect on relieving pain such as exercise and pain management appeared to be also significant factors to predict depression change. Therefore, it is possible that positive changes in pain might be also important to explain positive changes in depression, just as positive changes in depression was important to predict positive changes in pain, too.

Psychological strategies to predict positive changes in depression were differ from those to predict positive changes in pain. Positive changes in communication skill and knowledge about the disease were significant predictors only for explaining positive changes in depression. For communication strategy, patients learned what characteristics could be used to discriminate adaptive communication from maladaptive communication. Patients also demonstrated the adaptive communication which represented their usual conversation with their significant others such as spouse, children, friends, relatives, and physician. And they were encouraged to write communication diary every day. The average improvement rate of depression by practicing adaptive communication skills was 24 %.

Results of the present study suggest that the depression level can be decreased by promoting communication skills, but not by increasing level of knowledge about the disease. In fact, improvement of knowledge about the disease affected on the level of depression negatively. This result might be produced by clarifying or correcting obscurely believed or misunderstood informations related to RA (i.e., RA can not be expected to be cured so that the continuous management for disease will be needed).

Ninety-five percent of positive depression change can be explained by changes of predictors included in the present study. Such a high degree of explanation may reflect the overestimation of  $R^2$  due to small sample size with large number of predictors. To obtain more accurate estimation for  $R$ -square and stable estimation for parameters, further studies with large sample size will be needed.

## Conclusions and Recommendations

This study was performed to evaluate the effect of 7-week comprehensive health promotion program for RA patients (CHPPRA) on changes in pain and depression. In addition, it was also examined that this effect was generated by changes in patients' health promoting strategies (positive self-image, positive thinking, problem solving, communication, pain management, stress management, exercise, and knowledge about RA) learned through CHPPRA. Twenty-eight out-patients of RA clinic in a university hospital participated for this study. The results are as follows.

Changes in exercise, self-concept, positive thinking, problem solving, depression, and pain management were significant predictors to explain relieving pain level. Since all of these variables had positive standardized beta weights ( $\beta$ s), it can be interpreted that increasing level of these health promoting strategies may induce pain improvement.

Changes in positive thinking, communication skill, exercise, self-concept, pain management, and knowledge about the disease were significant predictors to explain positive change in depression. Since all of the significant variables except the change in knowledge about the disease had positive standardized beta weights ( $\beta$ s), it can be interpreted that increasing level of these health promoting strategies may induce improving depression level. However, our results showed that the higher level of the knowledge about the disease was, the worse depression was.

This study was regarded as a preliminary analysis for the effect of CHPPRA provided to 28 patients which represented relatively small group.

Further studies with large sample size will be necessary to verify results of the present study. In addition, measurement tools for health behaviors were not fully developed in this study. Therefore, developing measurement tools which show much higher reliability and validity will be required.

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