
APPLYING THE TRANSTHEORETICAL MODEL TO EXERCISE ADHERENCE IN CLINICAL SETTINGS

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Abstract: Research utilizing the Transtheoretical Model (TM) and social support within clinical exercise populations is lacking and this study assessed those constructs among cardiac and pulmonary rehabilitation program participants. There was an increase in the TM constructs for participants who completed rehabilitation. Also, several TM constructs were significantly related to the stages of change and adherence. Self-efficacy was the best predictor of adherence. Results indicate that the TM and social support can be used to understand adherence to cardiopulmonary rehabilitation programs. The results obtained from this study may assist in developing stage-based interventions that help individuals adhere to their rehabilitation program.

The link between physical activity and improved physiological and psychological health are well documented. Regular physical activity has been credited with physiological benefits including reduction in blood pressure, improved physical work capacity, improved cardiovascular efficiency, reduced adiposity, increased lean body mass, and favorable changes in blood lipids and lipoproteins (Frontera, Dawson, & Slovick, 1999). Additionally, physical activity can help reduce the risk of diseases such as hypertension, diabetes, cancer, obesity, and osteoporosis (Bouchard, Shephard, & Stephens, 1994). Regular physical activity has also been shown to lead to many psychological benefits including positive changes in anxiety, depression, stress, sleep, and self-esteem (Martinsen & Stephens, 1994). Considering all of these benefits, one would expect participation in regular physical activity to be the norm, yet epidemiological evidence suggests that most Americans are not physically active. Specifically, half of all Americans report little or no participation in leisure physical activity, and only 10% report engaging in vigorous activity three or more times per week (Crespo, Keteyian, Heath, & Sempas, 1996). Clearly, adherence to physical activity programs is a major concern and priority for health promotion professionals.

Concerns about adherence to physical activity programs extend to clinical populations. Despite the many physiological and psychosocial benefits associated with participation in cardiac and pulmonary rehabilitation programs, adherence in these settings is similar to that found in healthy populations (Oldridge, 1991; Kaplan, Atkins, & Reinsch, 1984). Failure to adhere to rehabilitation programs for these populations is especially important in light of the fact that more than 70 million Americans suffer from some form of cardiovascular or pulmonary disease that could derive benefits from participation in a supervised exercise program (American Heart Association, 1999; American Lung Association, 1994). Recognizing the magnitude of the health risk associated with poor adherence to cardiopulmonary rehabilitation programs, the purpose of this study was the examination of adherence to rehabilitative exercise programs within the framework of the transtheoretical model and social support.

TRANSTHEORETICAL MODEL

Prochaska (1979) developed the transtheoretical model (TM) from a comparative analysis of leading theories of psychotherapy and behavior change. This model utilizes the concepts of stages of change and

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processes of change in a format allowing for the design of programs to facilitate behavior change for target populations. The use of this model originated in addictive behaviors, but has been extended to areas including exercise adherence and may provide an important means of studying adherence to rehabilitation programs.

The six stages specified by the TM are (a) precontemplation, (b) contemplation, (c) preparation, (d) action, (e) maintenance, and (f) termination (Prochaska & DiClemente, 1983). Precontemplation is present when an individual does not intend to change their high-risk behaviors in the foreseeable future. A sedentary person with a very negative attitude regarding physical activity is in the precontemplation stage. Contemplation is present when an individual is giving serious consideration to behavior change. A sedentary person who is considering the need for increased physical activity is in the contemplation stage. Preparation is present when an individual has made a decision to take action toward change in the near future. A sedentary person who has already begun to make small changes in behavior and typically has a plan of action for change is in the preparation stage. Action is present when someone is actively participating in the new behavior for a brief period of time and the new behavior requires significant expenditure of effort. Maintenance is present when the new behavior has been demonstrated for an extended period of time and the new behavior requires increasingly less effort to maintain. Finally, termination is present when the new behavior has become rather automatic and requires no conscious effort.

These stages of behavioral readiness are linked to behavior change within the TM through activities used to modify behavior; these activities are known as "processes of change." Ten processes of change are included with TM and they can be divided into cognitive and behavioral classes. Cognitive processes involve gathering new information which results in a resulting in a changing of attitudes, and include (a) consciousness raising, (b) dramatic relief, (c) environmental reevaluation, (d) self-reevaluation, and (e) social liberation. Consciousness raising involves efforts to seek new information related to a behavior change. Dramatic relief consists of experiencing intense emotions related to the problem behavior. Environmental reevaluation is consideration and assessment of how the problem behavior affects the physical and social environments. Self-reevaluation includes emotional and cognitive reappraisal of values with regards to the problem behavior. Social liberation involves the awareness that social norms are changing in the direction of supporting the healthy behavioral change.

Behavioral changes involve activities that change overt behaviors and include (a) counterconditioning, (b) stimulus control, (c) contingency management, (d) self-liberation, and (e) helping relationships. Counterconditioning involves substituting a healthier behavior for the unhealthy behavior. Stimulus control involves having control of situations and other causes that trigger the unhealthy behavior. Contingency management involves changing the contingencies that control or maintain the problem behavior. Self-liberation consists of the individual's choice and commitment to change the problem behavior and the belief that it can be changed. Helping relationships is utilizing support from others during change efforts. This process will be discussed in more detail later as it relates to social support.

The third and fourth components of the TM are decisional balance and self-efficacy. Decisional balance is an individual's perception and evaluation of the relative costs (cons) and benefits (pros) associated with behavior change. The underlying assumption is that a person will not decide to change or continue in an activity unless he expects the pros to exceed the cons. Similarly, self-efficacy is the confidence a person feels about performing a particular activity, including confidence in overcoming the barriers to performing that behavior (Bandura, 1977). Self-efficacy beliefs are suggested to be an important prerequisite for behavioral change and are linked to an increased likelihood that the individual will engage in the behavior.

SOCIAL SUPPORT

The final construct providing the theoretical basis of this project is social support. This construct is also linked to behavior change and is defined as an interpersonal transaction involving emotional support (empathy, love, trust, and caring), instrumental support (tangible aid and service), informational support (advice, suggestions, and information), and appraisal support (information that is useful for self-evaluation) (House, 1981). Social support includes the resources provided by one's social network of family, friends, coworkers, health professionals, and community resources. These networks may assist in behavior change by providing appropriate information or encouraging the individual to participate in a healthy behavior.

RESEARCH APPLICATIONS

While the transtheoretical model and social support research originated in domains outside of exercise, each has been applied extensively to a variety of exercise contexts. However, research investigating the relationship between rehabilitative exercise programs and both social support and the TM is very limited,

and is currently limited to cardiac rehabilitation patients. Hellman (1997) utilized the TM to determine that perceived self-efficacy was an important predictor of stage of change and exercise adherence. Other research by Jue and Cunningham (1998) assessed the stages of exercise behavior in a group of older cardiac patients and determined that individuals in the precontemplation and preparation stages used the change processes less than those in the maintenance stage, which was the primary stage for this population. Among the best research in this area is provided by Bock and colleagues who studied cardiac rehabilitation patients (Bock, Albrecht, Traficante, Clark, Pinto, Tilkermeier, & Marcus, 1997). Results indicated that weekly exercise time was positively associated with advanced stages of readiness, high levels of self-efficacy, low ratings of cons for exercise, and higher use of behavioral processes.

Applications of social support to rehabilitative exercise programs are particularly sparse. Oldridge (1984) demonstrated that cardiac rehabilitation patients whose spouses were indifferent or negative about their exercise program were three times more likely to dropout. The findings also showed that lack of spousal support was the single most prominent factor that predicted non-compliance. Similarly, Fleury (1993) studied outpatient cardiac rehabilitation participants and found that social networks enabled the initiation and maintenance of positive health patterns including exercise. Work by Grodner and colleagues provide the only research to date that investigated the relationship between social support and pulmonary rehabilitation (Grodner, Prewitt, Jaworski, & Myers, 1996). Their results indicated that high levels of social support were associated with improvement and survival following pulmonary rehabilitation. Collectively, the existent research indicates that the application of social support and TM are appropriate for cardiopulmonary re-

habilitation exercise programs. However, the limited number of research studies and the nature of many of these projects indicate that further research is needed in this area. Therefore, the purpose of this project was to extend our existing knowledge base regarding the relationships between cardiopulmonary rehabilitation exercise programs and both the TM constructs and social support.

METHODS

PARTICIPANTS

Participants for this study were 40 individuals (22 female, 18 male, mean age (SD) = 60.3 (11.3) years, 33 Caucasian, 7 African American) involved in cardiac (n = 35) or pulmonary rehabilitation (n = 5) programs at hospitals in southeastern Louisiana. Each participant was involved in a rehabilitative program that included 36 sessions of exercise over a period of 12-18 weeks. From this sample, 30 participants completed all rounds of data collection and provided data for the study. Demographic characteristics are presented in Table 1.

MEASURES

The variables assessed in this study were physical activity participation, stages of change, processes of change, decisional balance, self-efficacy, and social support. Six instruments were used to collect data for this study. All have been tested and found to be valid and reliable.

7-day physical activity recall (PAR) questionnaire. Physical activity participation was measured using the 7-day PAR questionnaire (Sallis, Haskell, Wood, Fortmann, Rogers, Blair, & Paffenbarger, 1985). This measure consists of nine questions that relate to sleep habits and activities performed over the past 7 days. Raw data from the questionnaire were used to calculate energy expenditure in kcal x kg⁻¹ x day⁻¹. The

Table 1. Demographic Characteristics of the Sample.

	<u>Completers</u>	<u>Dropouts</u>	<u>Total</u>
Number	30	10	40
Age	61.53 (11.51)	56.40 (10.11)	60.25 (11.28)
Gender			
Female	15	7	22
Male	15	3	18
Race			
Caucasian	26	7	33
African American	4	3	7
Rehab			
Cardiac	26	9	35
Pulmonary	4	1	5

seven-day recall has been used in several studies and is consistent with daily self-report measures and electronic monitoring (Taylor, Coffey, Berra, Iaffaldano, Casey & Haskell, 1984). Test-retest reliability has been shown to be stable for both light and vigorous activity and hours of sleep (Sallis et al., 1985).

Stages of change questionnaire. Stage of change was assessed using the Stages of Exercise Adoption Scale (SEAS: Cardinal, 1995). This scale uses a 5-point ordered categorical measure that resembles a ladder with each rung representing a stage of change. Reliability for this measure (2-week Kappa index) was reported to be .78 (Marcus, Selby, Niaura & Rossi, 1992). This measure has also been shown to have a significant association with a 7-day physical activity recall questionnaire, thus demonstrating concurrent validity (Marcus & Simkin, 1993).

Decisional balance questionnaire. Decisional balance was measured using a 16-item survey that assessed the positive (pros) and negative (cons) aspects of exercise (Marcus, Rakowski & Rossi, 1992). Participants were asked to rate the importance of the pros and cons of exercise using a 5-point scale ranging from 1 (not at all important) to 5 (extremely important). Internal consistency, as reported by the developers of the instrument, was .95 for the pro items and .79 for the con items.

Self-efficacy questionnaire. Self-efficacy was assessed using a five-item survey designed to measure confidence in one's ability to persist with exercising in various situations (Marcus, Selby, Niaura, & Rossi, 1992). A 7-point scale ranging from 1 (not at all confident) to 7 (very confident) was used. Internal consistency and test-retest reliability over a 2-week period was reported by the developers of the instrument to be .82 and .90 respectively.

Processes of change questionnaire. Processes of change were assessed using a 39-item survey that assessed the use of behavioral and cognitive processes over the past month (Marcus, Rossi, Selby, Niaura & Abrams, 1992). A 5-point scale, reflecting the frequency of use, ranging from 1 (never) to 5 (repeatedly) was used. The developers of this instrument reported internal consistency for all 10 processes of change were between .81 and .89 except for social liberation, which was .62, and stimulus control, which was .73.

Social support questionnaire. Social support was assessed using a six-item survey (SSQ-6: Sarason, Sarason, Shearin, & Pierce, 1987) that assessed the degree of satisfaction with perceived social support. Participants were asked to rate how satisfied they were with support they receive. A 6-point scale ranging from 1 (very dissatisfied) to 6 (very satisfied) was used. The

developers of this instrument reported internal reliability between .90 and .93.

PROCEDURES

Staff at rehabilitation facilities worked closely with the first author throughout the project to ensure that data collection was handled in a timely and appropriate manner. Data was collected by way of survey packets that included an informed consent, a demographic sheet, a 7-day physical activity recall, and questionnaires for stage of change, decisional balance, self-efficacy, processes of change, and social support. Packets were administered to participants by rehabilitation staff upon entry into the program (baseline), midway through the program (mid), and at program exit (exit). Additionally, the packet administered upon entry into the program included a second stage of change questionnaire to identify stage of change prior to referral to rehabilitation (pre). Rehabilitation staff collected all data from participants and the authors were not professionally connected to any of the project sites. Permission to conduct this study was granted from the Institutional Review Board of the university affiliate of the authors.

STATISTICAL ANALYSIS

Data analysis was conducted in three stages. First, constructs of the TM were analyzed using separate repeated measures analyses of variance (ANOVAs) using three time points (Pre, Baseline, Mid, and Exit) to determine changes in these constructs over the course of rehabilitation. Second, bivariate correlations were conducted to examine relationships between stage of change and TM constructs. This set of analyses included all participants in the study, including those who completed and dropped out.

Finally, a set of analyses was conducted to examine the relationship between TM constructs and adherence to the rehabilitation program, defined as the number of sessions attended. For this set of analyses, TM construct data were averaged for each participant, and the scores for the individual processes of change variables were summed to create cognitive and behavioral processes of change variables. This method of classifying the data was done in an effort to examine general relationships between TM constructs, efficacy, and adherence. Correlations were conducted between the TM constructs and adherence to examine the relationship between the two variables. Then, a discriminant analysis was conducted to determine which variables differentiated completers and dropouts. Finally, a step-wise multiple regression analysis was conducted to determine the best predictors of adherence.

RESULTS

CHANGES IN TRANSTHEORETICAL MODEL CONSTRUCTS

As shown in Table 2, mean values for all TM constructs increased for participants who completed the program, except decisional balance. Statistical analysis of changes over time indicated significant increases in stage of change [$F(3, 87) = 3.11, p < .05$], physical activity [$F(2, 58) = 7.22, p < .01$], social support [$F(2, 58) = 9.09, p < .01$], self-efficacy [$F(2, 58) = 18.89, p < .01$], cognitive processes [$F(2, 58) = 14.66, p < .01$], behavioral processes [$F(2, 58) = 27.57, p < .01$], decisional balance pros [$F(2, 58) = 5.78, p < .01$], and decisional balance cons [$F(2, 58) = 3.83, p < .05$]. Thus, the rehabilitation process was associated with participants moving along the stages of change continuum as well as showing changes in attitudes, perceptions, and cognitions related to health behavior.

Additionally, descriptive data for the processes of change over the phases of rehabilitation were computed for participants who completed measures at all time points (see Figure 1). Scores for self-liberation (SE) and self-reevaluation (SR) tended to be higher than the other processes, and stimulus control (SC) was the lowest throughout rehabilitation. A change score for the 10 processes of change over the phase of rehabilitation was also computed to assess the degree to which process scores increased from baseline to exit. In order of decreasing value, the greatest change scores were found for counterconditioning (CC), helping relationships (HR), social liberation (SO), and contingency management (CM). Thus, as a group, participants in the study reported increases in substituting healthy behaviors for unhealthy ones, seeking support from others to assist in behavior change, becoming more aware of the social acceptance of healthy behav-

iors, and changing contingencies to help control problem behaviors.

RELATIONSHIPS BETWEEN TRANSTHEORETICAL MODEL CONSTRUCTS AND STAGE OF CHANGE

Correlational analyses between stages of change and TM constructs revealed several significant relationships. Behavioral processes ($r = .39$) and self-efficacy ($r = .36$) had the highest correlations with stage of change. Social support ($r = .34$), decisional balance ($r = .26$), and cognitive processes ($r = .24$) were also significantly correlated to stage of change. Thus, positive moves along the stages of change scale were associated with greater use of cognitive and behavioral processes or activities to change behavior, greater self-efficacy to adhere to the program, greater perceptions of social support, and the perception that the advantages of persisting with rehabilitation outweighed the disadvantages.

RELATIONSHIPS BETWEEN TRANSTHEORETICAL MODEL CONSTRUCTS AND ADHERENCE

Relative to adherence to the rehabilitation program, the results of correlational analysis indicated that stage of change ($r = .56$) and self-efficacy ($r = .53$) were both highly related to the number of exercise sessions completed. Decisional balance ($r = .44$), behavioral processes ($r = .42$), social support ($r = .38$), and cognitive processes ($r = .36$) were also significantly correlated to adherence. That is, participants who attended more exercise sessions of rehabilitation were at a higher stage of change, and tended to have a greater belief in their ability to adhere to the program, feel the advantages of rehabilitation outweighed the disadvan-

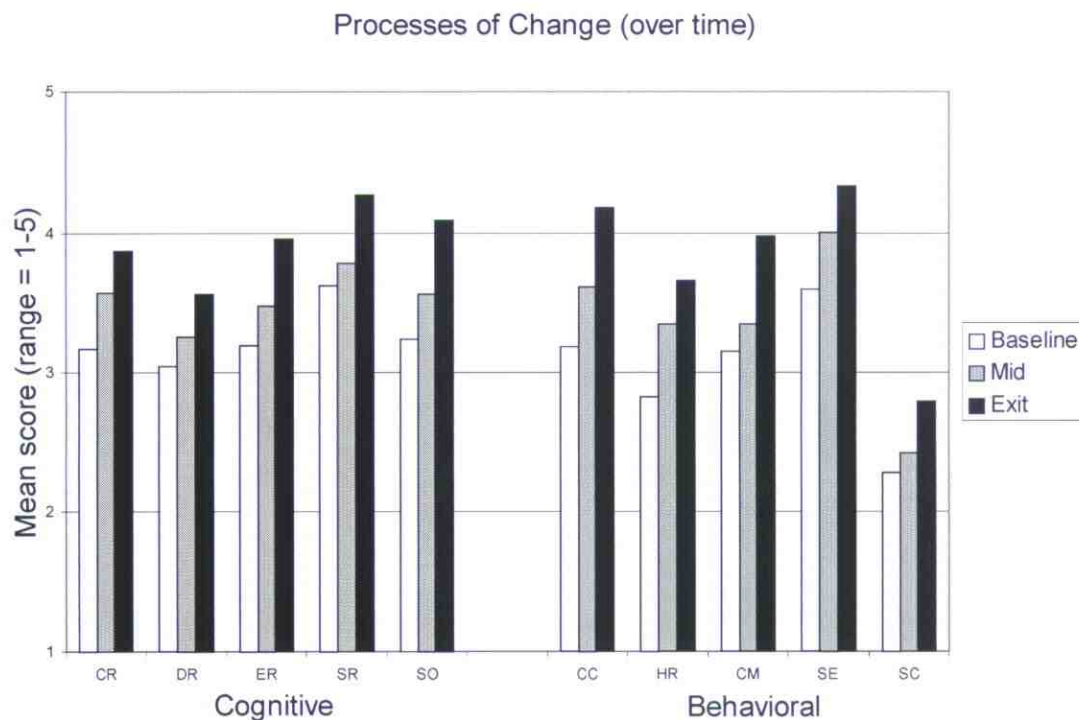
Table 2. Mean Values of the TM Constructs Over the Course of the Study

	<i>Pre</i>	<i>Baseline</i>	<i>Mid</i>	<i>Exit</i>
STAGE**	2.10 (1.09)	2.53 (0.78)	3.03 (0.41)	4.17 (5.46)
PAR**		34.17 (2.73)	36.07 (4.67)	36.57 (4.23)
Social support **		4.22 (1.41)	4.67 (1.19)	4.95 (1.33)
DBP*		4.08 (0.84)	4.13 (0.84)	4.45 (0.65)
DBC*		2.69 (1.06)	2.68 (0.94)	3.18 (1.13)
DB		1.39 (1.29)	1.45 (1.16)	1.27 (1.23)
Self efficacy **		3.89 (1.78)	4.39 (1.55)	5.21 (1.36)
Cognitive processes **		3.26 (0.97)	3.53 (0.87)	3.95 (0.72)
Behavioral processes **		3.01 (0.94)	3.35 (0.85)	3.79 (0.75)

** $p \leq .01$

* $p \leq .05$

Figure 1. Processes of change over the course of the study.



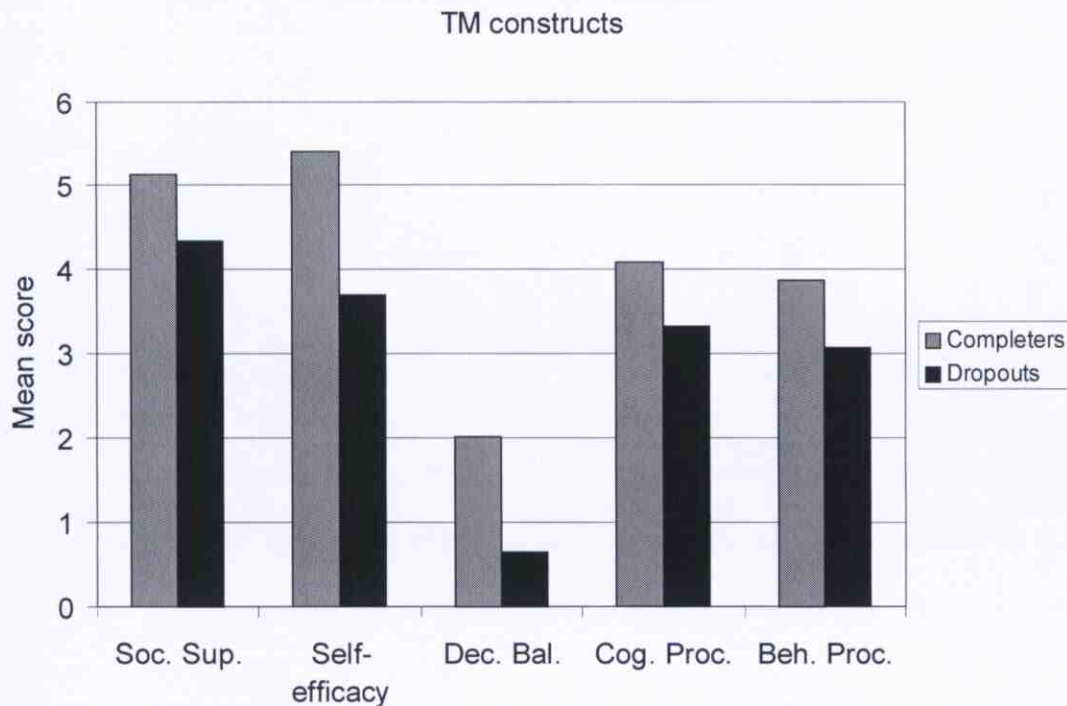
tages, engage in more behavior change activities, and perceive greater support from family and friends.

The ability to predict rehabilitation adherence using the TM constructs was examined using both discriminant analysis and regression analysis. Mean values of TM variables for completers and dropouts, presented in Figure 2, show a pattern of higher scores for completers as compared to dropouts. The TM constructs that distinguished between completers and dropouts were analyzed through a discriminant analysis. Two variables entered the analysis: self-efficacy [$F(1, 38) = 13.63, p < .001$] and cognitive processes [$F(2, 37) = 9.91, p < .001$]. Using these two variables, 85% of the sample could be correctly classified. Additionally, step-wise multiple regression was conducted using adherence as the criterion variable, and social support, decisional balance, cognitive processes, behavioral processes, and self-efficacy as predictor variables. Self-efficacy was the only variable entered into the equation [$F(1, 38) = 15.15, p < .001$] and it accounted for 28% of the variance ($SEE = 9.90$). The results of these analyses indicate that participants' self-efficacy levels and the extent to which they engaged in cognitive processes related to behavior change were the best predictors of adherence to rehabilitation.

DISCUSSION

The Transtheoretical Model (TM) has been used to study behavior change in numerous areas and is a proven lens through which exercise behavior may be studied, and appears to also be appropriate research on cardiopulmonary rehabilitation. However, the extent to which TM constructs apply to rehabilitation behavior has yet to be adequately studied. In this study, 30 patients engaged in cardiac and pulmonary rehabilitation completed instruments designed to assess the major constructs of the TM model and social support. Changes in variables over time were examined, and the relationships between variables and adherence to the program were assessed. Our results support the following conclusions: (a) many of the TM constructs increased over the course of the study for those who completed the rehabilitation program, (b) several variables were significantly correlated to stage of change, (c) several variables were significantly correlated to adherence, (d) completers had higher scores on all of the focus variables than dropouts, (e) self-efficacy and cognitive processes differentiated completers and dropouts, and self-efficacy was the best predictor of adherence.

Figure 2. Mean values of the TM variables for completers and dropouts.



CHANGES IN TRANSTHEORETICAL MODEL CONSTRUCTS

The TM constructs increased over the course of the study for those who completed the program. These constructs were stage of change, physical activity, self-efficacy, social support, decisional balance pros, decisional balance cons, cognitive processes, and behavioral processes. In addition, all of these variables were significantly different between baseline and exit. Stage of change and physical activity would both be expected to increase because the individuals progressively increased their activity level throughout the program. Bock and colleagues (1997) found similar results when they investigated individuals enrolled in a cardiac rehabilitation program. Similarly, one would expect self-efficacy for exercise to increase as individuals become more familiar with exercising on a regular basis. This notion is supported by previous research in the areas of exercise (Gorely & Gordon, 1995; Marcus, Selby, et al., 1992) and cardiac patients (Bock et al., 1997; Hellman, 1997). Additionally, individuals in the present study demonstrated an increase in perceived social support as they progressed through rehabilitation, a finding that parallels that of Fleury (1993) who studied individuals enrolled in a cardiac rehabilitation program.

In the present study decisional balance pros and cons both increased over time, and pros were consistently higher than cons. The increase in decisional balance pros was expected, but the increase in decisional balance cons was not expected based on previous research (Marcus & Owen, 1992; Marcus, Rakowski, et al., 1992). It is not known why participants' views of the cons of exercise increased throughout rehabilitation. However, these individuals may view the cons of exercise as greater towards the end of rehabilitation due to the realization that they will soon return to a life without a structured rehabilitation program. This anticipation of future barriers to exercise may negatively impact current ratings. Interestingly, the paralleled increase in both pros and cons with continued exercise adherence points to the importance of maintaining high levels of pros to exercise throughout rehabilitation.

The findings relative to the processes of change revealed that both cognitive and behavioral processes increased as participants progressed through rehabilitation. These results are similar to those reported in worksite settings (Marcus, Simkin, Rossi & Pinto, 1996) and in older exercisers (Gorely & Gordon, 1995). Other studies have found opposing results when studying the processes of change. Jue and Cunningham (1998) documented no significant dif-

ferences between the majority of the processes of change in cardiac patients at two different time periods. Behavioral processes were found to increase and cognitive processes showed no change in a study conducted by Bock and colleagues (1997) that included cardiac rehabilitation patients. The authors attributed the differences to the circumstances surrounding rehabilitation. Circumstantial reasons may also explain why the processes of change were used throughout rehabilitation in the current study. These individuals were not adopting exercise on their own, but became more active as a result of a prescribed rehabilitation program. Because of this trend, they were still changing their attitudes about exercise even at the end of the program.

The individual processes of change were also examined over the course of rehabilitation. Gorely and Gordon (1995) found that certain processes were more likely to distinguish individuals between stages in older adults exercise behavior. In our study, all of the individual processes increased from baseline to exit. However, some were utilized more often and others showed greater changes over the course of rehabilitation. Self-liberation and self-reevaluation had the highest means throughout the program and counterconditioning, helping relationships, and social liberation had the greatest change from baseline to exit. Use of these cognitive processes (self-reevaluation and social liberation) suggest that individuals continue to reappraise their values related to exercise and were more aware of the social influences to exercise throughout rehabilitation. Furthermore, changes in behavioral processes (helping relationships, self-liberation, and counterconditioning) indicated that participants continued to commit to exercise behavior change, substituted exercise for unhealthy behaviors, and utilized support from others over during rehabilitation. These individual processes may be especially useful to individuals as they progress through rehabilitation.

RELATIONSHIPS OF THE TRANSTHEORETICAL MODEL CONSTRUCTS

Several significant relationships existed between the TM constructs and stage of change in the present study. The constructs that were significantly correlated to stage of change included social support, decisional balance, self-efficacy, cognitive processes, and behavioral processes. All of these variables were utilized to advance individuals through the stages of change, however, self-efficacy and behavioral processes exhibited the strongest relationships with stage of change. These results parallel the previous findings of Marcus and Owen (1992) who studied employees at several

worksites and found that self-efficacy was significantly related to stage of change. Similarly, the processes of change have also been found to be related to stage of change in for employees at two worksites (Marcus, Rossi et al., 1992).

In addition to showing relationships to stage of change, several TM constructs were also significantly correlated with adherence: stage of change, social support, decisional balance, self-efficacy, cognitive processes, and behavioral processes. The significant relationships that existed between these constructs and adherence suggest that individuals who utilize them are more likely to adhere to an imposed programmed rehabilitation program. These findings support earlier work in the area of exercise adoption where TM constructs were also found to be related to adherence (Cardinal, 1995; Gorely and Gordon, 1995; Marcus, Rossi, et al., 1992; Marcus, Selby et al., 1992; Marcus, et al., 1996).

COMPLETERS VS. DROPOUTS

In the current study, individuals who completed the rehabilitation program had higher scores on all of the focus variables when compared to dropouts. These variables included social support, decisional balance, self-efficacy, cognitive processes, and behavioral process. This indicates that individuals utilizing these variables are more likely to adhere to rehabilitation. Studies in the areas of cardiac rehabilitation and exercise adherence have found similar results. Specifically, Hellman (1997) reported self-efficacy and decisional balance were related to adherence in recently discharged cardiac rehabilitation participants and Marcus and colleagues (1996) found processes of change related to exercise adherence in worksite fitness programs.

Discriminant analysis revealed that self-efficacy and cognitive processes were the two variables that most differentiated completers and dropouts in this study, and that these two variables allowed the majority of participants to be correctly classified as either a completer or dropout. Self-efficacy was also singled out as the best predictor of adherence in this sample in a stepwise multiple regression predicting the number of sessions attended. In similar studies, self-efficacy has been consistently found to predict adherence to behavior change (Gorely & Gordon, 1995; Hellman, 1997; Marcus, Selby, et al., 1992), but the finding that the cognitive processes differentiated adherence is unique. This finding indicates that individuals who were able to maintain the program utilized the cognitive processes more than those who quit. These processes may be more relevant to rehabilitation populations because more positive attitudes and opinions of

exercise may not yet be present upon entry into the rehabilitation program in response to a medical event.

CONCLUSIONS AND RECOMMENDATIONS

The general conclusions of the study support using TM constructs and social support to study exercise adherence in rehabilitation programs. Several findings differed from previous research (particularly the increase in decisional balance cons, and cognitive processes serving as an important predictor of adherence), but overall the findings parallel earlier work done in non-rehabilitation settings, and support the use of this model with cardiac and pulmonary rehabilitation populations.

The results obtained from this study may assist in developing stage-based interventions to improve adherence to rehabilitation programs. One application of this research is the utilization of questionnaire packets to determine individual needs relative to the components of the TM and social support, followed by developing appropriate interventions specifically designed to increase target variables in specific patients. While many activities would be appropriate, our research suggests that likely focus areas should be building self-efficacy and promoting the development of the cognitive processes of change. These objectives can be reached through effective short-term goal setting and the delivery of appropriate educational content relevant to these clinical populations. These activities should result in the enhance the likelihood of achieving

the ultimate goal of rehabilitation program completion and improved health.

Possible weaknesses of this study include sample size and the inclusion criteria. The sample was limited to those individuals who were participating in a cardiopulmonary rehabilitation program that volunteered to participate. The fact that they willingly chose to participate in rehabilitation and the present study may reflect a higher regard for changing health behaviors than those who chose not to participate. In addition, while some data was available on participants who dropped out of the program, the exit of these individuals reduced the data so that those who completed the program provided the majority of data. Thus, the application of these findings applies primarily to individuals who adhere to programmed rehabilitation.

Future research on the TM and cardiopulmonary rehabilitation is essential for health professionals to better serve a growing population of individuals enrolled in these programs. Results from existing research and the current project are promising, but only a limited number of studies have been conducted to date. Pulmonary rehabilitation needs to be addressed since this is the only study to date that we are aware of that has applied this theoretical model to pulmonary populations. Additionally, studies that incorporate longer follow-up analyses which extend beyond program exit are needed due to the high dropout rate between six and twelve months following behavior change. This research could then be utilized to incorporate relapse prevention into rehabilitation programs that focus on adherence to exercise after rehabilitation.

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HEALTH EDUCATION RESPONSIBILITY AND COMPETENCY ADDRESSED

Responsibility II – Planning Effective Health Education Programs

Competency B – Develop a logical scope and sequence plan for a health education program

Sub-competency 5 – Develop a theory-based framework for health education programs

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