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A Self Directed Adherence Management Program for Patients' with Heart Failure Completing Combined Aerobic and Resistance Exercise Training

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Abstract

This study measured the impact of the Exercise Adherence Management Program (EAMP) provided to 20 patients with heart failure (HF) who participated in a combined resistance and aerobic exercise training program during two, 12 week phases. The EAMP included strategies designed to support exercise self-efficacy and adherence. Results indicate an improvement in exercise self-efficacy occurred during the study period while exercise adherence declined during the unsupervised phase. The highest rated adherence strategy for helpfulness and self-efficacy was group sessions. The study supports the use of adherence strategies based on self-efficacy in exercise programs for patients with HF.

Keywords

exercise; adherence; heart failure; self-efficacy; self-care

Numerous studies have documented improved physiological and quality of life outcomes associated with exercise training for patients with heart failure (HF). Aerobic and more recently resistance exercise are both reported beneficial for patients with HF. Exercise is difficult for most patients but the commonly reported symptoms of fatigue and dyspnea make continued exercise especially difficult for patients with HF. It is reported that as few as 30% of patients with HF participate in exercise (Ni, Naumen, Burgess, Wise, Crispel, & Hershberger, 1999). Despite the importance of adherence to the benefits of exercise, there is

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little understanding of the process of exercise adherence or of ways to improve it. The purpose of this study was to assess the impact of the Exercise Adherence Management Program (EAMP) provided to patients with HF participating in a combined aerobic and resistance exercise training program.

Background

Aerobic and Resistance Exercise and Heart Failure

The most common and earliest complaint in patients with HF is exercise intolerance, yet, exercise is reported beneficial for HF (Piña, Apstein, Balady, Berladinelli, Chaitman, Duscha, et al., 2003). Aerobic exercise has been reported to improve HF but more recently the inclusion of resistance training, alone and in conjunction with aerobic exercise, is also reported to be beneficial. Outcomes associated with combined resistance and aerobic exercise programs include: reduced HF symptoms, increased exercise capacity, increased physical function, and enhanced quality of life (Delegardelle, Feiereisen, & Autier, 2002; Oka, DeMarco, Haskell, Botvinick, Dae, Bolen, et al., 2000).

Exercise Adherence

Patients with HF recognize the need for exercise with nearly 95% of patients indicating exercise is important. However, the majority of the patients report they are not physically active 5 days a week, and 60-70% report no exercise (Ni et al., 1999; Schweitzer, Head, & Dwyer, 2007). The symptoms associated with HF may interfere with exercise and patients may stop exercising before benefits are recognizable. Compounding the effects of time is the transition from supervised exercise training to unsupervised, self-directed exercise. Several training programs have maintained adherence during supervised sessions only to observe declines in adherence during transition to self-managed exercise (Gary, 2006; McKelvie, et al., 2002).

Despite recognition of the link between adherence and achievement of the benefits of exercise in HF, few studies have focused specifically on exercise adherence. In addition, little is known about adherence to different types of exercise training, especially in HF. Several factors may contribute to this lack of evidence. Recommendations for the optimal aerobic and resistance prescription for HF are not established (Smart & Marwick, 2004). Since combined aerobic and resistance programs are more recent, adherence in these protocols has been less studied. Programs that combine types of exercise likely complicate the understanding of adherence. Yet, understanding adherence in combined programs may be crucial to determining their outcomes.

The understanding of exercise adherence is further limited by reliance on frequency of exercise participation as the primary adherence outcome (Barbour & Miller, 2008). Many studies report only total attendance at exercise sessions at study endpoints, a global measure that does not address adherence to specific exercise components. Data on exercise duration and intensity, core components of exercise prescription, are limited. The process of evaluating adherence to exercise over time is hampered by few reports of weekly adherence. Reliance on overall attendance data and partial data on exercise components limits the understanding of adherence to all types of exercise programs.

The importance of adherence mandates a need for interventions to sustain exercise. In an analysis of 38 reviews on adherence, it was concluded that half of all adherence interventions fail (van Dulmen, Sluijs, van Dijk, de Ridder, Heerdink, & Bensing, 2007). Several approaches are suggested in literature but few are delineated with enough detail for future replication and effectiveness of adherence strategies remains largely unknown (Barbour & Miller, 2008).

Application of Self-efficacy to the Exercise Adherence Management Program

Self-efficacy provides a conceptual framework for the design of an adherence management program. According to Bandura (1997), adhering to a new behavior requires more than motivation. Patients must learn self-regulation skills. Self-regulation includes the sub-set skills of goal setting, feedback, and monitoring. Goals provide performance directives. Monitoring a new behavior provides information on performance progress and feedback on past performance helps patients become aware of the need to change. Adherence programs that help patients master self-regulation lead to stronger commitment to a new behavior such as exercise and instill a sense of efficacy or confidence for future success.

Self-regulation skills may be especially useful for patients with chronic illnesses like HF who may have little past experience with different types of exercise and may be anxious about exercising. The Exercise Adherence Management Program (EAMP) was designed to incorporate strategies derived from self-efficacy theory that promote self-regulation. The selected strategies included: exercise logs, heart rate monitor watches, group support sessions, goal setting, graphic feedback, and an Internet web-site (Table 1).

Exercise logs—Logs are frequently used in exercise protocols to monitor exercise participation. Recording exercise activity helps patients to learn self-monitoring behavior needed for self-efficacy. In a review of interventions to increase activity, larger effect sizes were noted in studies that included self-monitoring behaviors than those who did not (Conn, Valentine, & Cooper, 2002).

Heart rate monitor watches—Patients with HF may experience anxiety with exercise. Watches that monitor heart rate can provide feedback on cardiac response that can be shared with health professionals who can help patients interpret individual exercise response. Understanding physiological data fosters self-monitoring skills that build confidence in the ability to exercise independently.

Group support sessions—Group support can help patients with HF develop confidence with exercise. Peers can support each other while adapting to an exercise program through discussion and sharing of personal experience. Sharing difficulties and success with exercise provides vicarious experiences that foster self-efficacy. While often incorporated into exercise protocols, the use of group support for exercise self-efficacy in HF has not been well tested.

Goal setting and graphic feedback—Both goals and feedback are needed to develop self-regulation skills. Exercise goals clarify exercise participation. Feedback frames the goals in terms of performance accomplishment and when used together, support self-efficacy. Goal setting recommendations include the use of difficult but achievable, short-term goals specific to the exercise protocol (Conn, et al., 2002). Feedback is effective when it is positive, supportive, and targeted to a specific behavior. Feedback is often included as part of an exercise protocol without specific descriptions of its use or how it supports adherence (DiClemente, Marinilli, Singh, & Bellino, 2001). Graphs are ideal for providing feedback. Graphs help patients visualize past participation in comparison to goals which helps them recognize the need for improvement.

Internet web-site—It is estimated that over 70% of the US has access to the Internet (Madden, 2007). The Internet offers the potential to be an effective method to provide exercise adherence support. Many of the strategies that can be provided face to face, by phone, or by mail can be delivered via the Internet. Web-sites may be especially useful for exercise support during times when patients self-manage exercise adherence. There has been

little use of the Internet to support exercise adherence by patients with HF and few studies have included the Internet as an option for the delivery of adherence strategies.

Summary—Ultimately, the benefits of exercise depend on continued exercise. Combined aerobic and resistance exercise programs have improved outcomes for HF but adherence in combined programs remains unknown. Despite recognition of the difficulty in continuing exercise, few studies have investigated ways to improve adherence. Strategies designed to foster self-efficacy may help improve patient confidence and lead to long-term exercise participation.

Aims

The specific aims of the study are:

- 1). Compare weekly exercise patterns for aerobic and resistance exercise over the 24-week study period.
- 2). Compare adherence outcomes for aerobic exercise (frequency, duration, intensity, and percent of goal achievement) to adherence outcomes for resistance exercise (frequency and goal achievement) during two, 12 week phases of adherence management.
- 3). Assess change in exercise self-efficacy (Cardiac Exercise Self-Efficacy Instrument, CESEI) from baseline to end of study (24 weeks).
- 4). Describe patient perception of self-efficacy and helpfulness for selected adherence strategies and compare the relationship between perception of the adherence strategies to adherence outcomes for both types of exercise.

Methods

Sample and study site

Sample—The sample for this study was the 22 subjects in the intervention group of a randomized controlled trial (RCT) that tested the effects of an exercise training protocol (HEART Camp, Pozehl [PI]; R15NR009215). The subjects in the RCT were recruited from a mid-western HF clinic, were adults with an ejection fraction (EF) of 40% or less, and had been receiving optimum, stable pharmacological therapy for at least 3 months. Patients were excluded if they had disorders preventing exercise participation, or had participated in exercise 3 or more times/week during the past 12 months. Participants in the RCT were randomly assigned to either the exercise group or an attention control group. The attention control group did not participate in exercise training or receive the EAMP and did not provide data for this study. After completion of Phase 1, one patient died of an unrelated cause and another patient could no longer exercise due to an unrelated preexisting condition. Therefore, during Phase 2, the exercise group consisted of 20 patients. Post hoc sensitivity power analyses indicate that with the available 20 subjects, a two-sided paired t-test would have power $\geq .80$ only for a standardized mean difference of at least .66, typically considered a medium to large effect.

Study site—During the study period, patients in the exercise group were provided access to an exercise facility at a local hospital, without charge. Patients were allowed to exercise at other locations, including home, but were encouraged to use the study facility.

Exercise Adherence Management Program (EAMP)

The EAMP consisted of several strategies reported to support exercise participation and to increase self-efficacy. The selected strategies are: exercise logs, heart rate monitor watch, group support sessions, goal setting and graphic feedback, and an Internet web-site (See Table 1).

Exercise logs—Participants completed exercise logs following each exercise session. Patients recorded the date of each session, number of minutes for aerobic exercise, warm-up and cool down activities, and aerobic intensity rating (rating of perceived exertion, RPE). For resistance exercise, patients recorded the dates of exercise. The logs included a section for recording any symptoms experienced. Logs were reviewed weekly for symptoms experienced.

Heart rate monitor watch—Polar Beat watch (Polar Electro Inc., Woodbury, NY) is a heart rate monitor that is worn on the patient's wrist and displays heart rate. Patients were given Polar watches at the beginning of Phase 1 for use throughout the study.

Group support sessions—Group sessions were conducted by research investigators during Phase 1 for 1 hour at the exercise facility. Patients participated in the group sessions in cohorts of six to eight patients. Each cohort group met weekly during the first 3 weeks of Phase 1, biweekly in weeks 4 to 12. Sessions included discussion of members' exercise concerns and sharing of personal experiences with exercise. During the sessions, the investigators reviewed web-site use, graphs, and addressed questions regarding exercise issues.

Goal setting—Exercise goals were determined for each patient in consultation with the study exercise physiologist based on CPX results at the beginning of the study. Goals for aerobic exercise were frequency of three sessions/week, of 30 minutes duration (plus 15 minutes warm-up and cool down), and at an intensity rating of 11-12 on the RPE scale. Goals for resistance exercise were frequency of two sessions/week performed on the non-aerobic exercise days. Goals were incorporated on graphs and adjusted throughout the program based on individual progress.

Graphic feedback—Weekly exercise performance data was abstracted from participant logs and depicted on graphs. Bar graphs displayed weekly frequency (number of aerobic and resistance sessions), aerobic duration (mean minutes), and aerobic intensity (mean RPE ratings). Participants were given hard copies of graphs at three week intervals and graphs were reviewed with patients by the investigators at group sessions in Phase 1. Positive feedback was provided for progress consistent with goals and problem-solving occurred for exercise less than goal level.

Internet web-site—A web-site was created for the study. Each patient was given an individual log-in and password. Patients were trained in access and use of the site by the investigators at each group session. The web-site consisted of the home page with a menu of options, information on the exercises, contact information for the investigators and the cardiology clinic, a group discussion section available to each cohort group, individual exercise logs, and participant's exercise graphs. Patients had access to only their own exercise graphs. Throughout the study period, the web-site discussion board was monitored for symptoms reported and discussion questions that necessitated follow-up.

Phases of the Exercise Adherence Management Program

The EAMP was composed of two, 12-week phases, designed to foster the development of exercise self-efficacy.

Phase 1, weeks 1-12, structured phase—The adherence management strategies were provided by the study investigators to patients during one-hour group sessions.

Phase 2, weeks 13-24, self-management phase—In Phase 2, patients self-managed use of the adherence strategies. Patients had access to the strategies but the investigators did not communicate with patients unless contacted, or unless log data indicated symptom concerns. No group sessions were scheduled but members could call or email the other members or investigators. Exercise logs were available at the study site and on the web-site. Graphs of exercise progress were updated and placed in each participant's folder at the study site and also on-line. Patients continued to utilize the heart rate monitor watch provided in Phase 1.

Exercise Protocol

The study was approved by the Institutional Review Boards (IRB) for the investigators' institution and the study site. Prior to beginning the exercise program, participants in the exercise group completed a cardiopulmonary exercise test (CPX) in order to guide individual exercise prescriptions and protect against risks associated with exercise. During the first 3 weeks of Phase 1, patients exercised in a supervised and cardiac monitored rehabilitation setting at an acute care hospital three times/week. This period allowed for cardiac monitoring to evaluate patient response to exercise and for training on aerobic and resistance exercises. Patients were instructed to complete the resistance exercises at home on two non-aerobic days in order to reduce fatigue. Following week 3, patients exercised independently at the study site or at home. Aerobic exercise training consisted of walking on a treadmill, use of an elliptical trainer and recumbent bike. Resistance exercise included eight exercises for upper and lower body using either resistance bands or light (5-10 lbs) weights that were provided for home use.

Instruments

Adherence outcomes—Adherence was defined as continued participation in the exercise program at the level prescribed. Adherence was measured by frequency (number of sessions completed per week), aerobic duration (mean minutes per session), and aerobic intensity (mean RPE). Adherence data were obtained from the exercise logs. Percent goal achievement was determined by dividing past adherence (number of sessions, mean duration, mean RPE), by goal (number of sessions, duration, RPE,) and multiplied by 100.

Exercise Self-efficacy—The 16 item Cardiac Exercise Self-Efficacy Instrument (CESEI) by Hickey, Owen & Forman (1992) was revised to measure perceived self-efficacy (SE) for exercise in cardiac rehabilitation programs. Items from the original tool that referred to pre-hospital activity were revised for the HF population. The CESEI was administered at baseline and at 24 weeks. The Cronbach's alpha for the revised instrument was 0.97 at baseline and 24 weeks.

Perception of helpfulness and self-efficacy for adherence strategies—At conclusion of the study, patient perception of the helpfulness and self-efficacy for each strategy (exercise logs, heart rate monitor watch, group support sessions, goal setting and graphic feedback, and an Internet web-site) was measured. Helpfulness of each strategy was rated on a scale of 0 (not at all helpful) to 10 (extremely helpful). Self-efficacy in the use of

each strategy was assessed by participant's response to the question, "how confident are you that you can use (insert strategy) to continue exercising". Responses were rated on a scale of 0 (not at all confident) to 10 (extremely confident). To reduce bias in evaluation of the EAMP strategies, ratings were obtained by a non-investigator.

Data Analysis

Data were analyzed by descriptive and graphic summaries. Paired t-tests (two-sided) were used to test mean difference across phases for aerobic exercise frequency, duration, and intensity; resistance exercise frequency; and combined (aerobic and resistance) exercise frequency. Relationships between adherence outcomes and strategy ratings were quantified using Spearman rank correlations. Tests of significance used $\alpha = .05$.

Results

Demographics

The sample was 55% male (11 males, 9 females), 95% Caucasian (1 African American). Mean age was 59.9 ± 13.8 yrs., and mean EF was $32.73 \pm 6.1\%$.

Aim 1. Comparison of weekly exercise patterns for aerobic and resistance exercise over the 24 week study period

Weekly exercise frequency trended down throughout the study. Weekly aerobic exercise participation was highest in the first 10 weeks (Phase 1) and peaked at week 8. Participation patterns for resistance exercise were similar to aerobic exercise. Highest frequency occurred in the first 8 weeks of Phase 1 and in week 4 of Phase 2 (week 16). Lowest frequency of resistance exercise occurred in weeks 21 to 24 (last 4 weeks) (See Figure 1).

Aim 2. Comparison of adherence outcomes for aerobic exercise to adherence outcomes for resistance exercise during two phases of adherence management

Analysis of adherence outcomes supported weekly trends. Aerobic frequency declined from Phase 1 to Phase 2 ($t(19)=3.72$, $p=.001$) as did adherence to resistance exercise ($t(19)=2.74$, $p=.013$). Average duration of aerobic sessions was similar during both phases and exceeded 100% of goal. Ratings for exercise intensity (RPE) were similar in Phase 1 and Phase 2 and exceeded goal level. There were no significant differences in intensity or duration of exercise between phases (Table 2).

Aim 3. Assess change in exercise self-efficacy (CESEI) from baseline to end of study (24 weeks)

Exercise self-efficacy increased from a mean of 3.0 ($\pm .82$) at baseline to a mean of 3.97 ($\pm .97$) at week 24 ($t(17)=9.7$, $p<.001$).

Aim 4. Describe patient perception of self-efficacy and helpfulness for selected adherence strategies and compare the relationship between perception of the adherence strategies to adherence outcomes for both types of exercise

Of the adherence strategies provided, patients rated group support sessions highest for self-efficacy and helpfulness in continuing to exercise. All strategies except the web-site were rated at 7 or above, indicating patients perceived them as helpful and were confident in their use. The website was lowest rated at a mean of 5.4 for self-efficacy and a mean of 5.0 for helpfulness (See Figure 2).

Significant correlations were observed between strategy ratings for heart rate watches and group support sessions and the number of combined exercise sessions in Phase 2. Frequency

of exercise sessions in Phase 2 was positively correlated with helpfulness ratings for heart rate monitor watches ($r=.47, p=.04$) and negatively associated with helpfulness of group support sessions ($r=-.48, p=.04$). Patients who did more exercise sessions in Phase 2 rated heart rate watches higher in helpfulness. Patients who did fewer sessions reported group support as more helpful. There were no other significant ($p<.05$) correlations between strategy rating and exercise sessions in Phase 2 and no associations for Phase 1 exercise frequency and strategy ratings. (Table 3)

Discussion

Exercise adherence and EAMP

The exercise training program for participants in this study was relatively demanding (5 days/week), especially for patients with HF who have not routinely exercised in the last 12 months as required for participation in this study. Less than 11% of HF patients report exercising 5 days/week (Schweitzer, Head, & Dwyer, 2007). Patients in this study achieved nearly 73% of the 24 week combined frequency goals for aerobic and resistance exercise while maintaining duration and intensity slightly above goal level.

Similar to previous reports, this study observed a decline in exercise frequency for both types of exercise over time and during the self-management phase. It is difficult to compare weekly trends to other studies as few report weekly adherence. Other studies have noted a decline in participation with time, most notably during home-based, unsupervised exercise (McKelvie et al., 2002; Gary, 2006; Oka et al., 2000). If weekly exercise patterns can be confirmed by future studies, it may be possible to identify ideal time intervals for boosters of adherence strategies. Findings from this study suggest intervening during the last weeks of a self-management program may be helpful in sustaining exercise participation.

This study required aerobic and resistance exercise on different days of the week and patterns of participation were similar for both types of exercise. Other programs have combined both types of exercise on the same day and reduced the number of exercise days. Performing both types of exercise on the same day provides for more rest days which may increase adherence but if this schedule increases the physical demands of each session, then adherence may decline. The efficacy of aerobic and resistance exercise on combined versus separate days or the ideal “dose” of each type of exercise remains under study. Until clear recommendations are available, studies of combination exercise programs need to report full adherence data for both types of exercise so that evaluation of exercise protocols include the impact on adherence.

Self-efficacy—The EAMP combined several strategies based on self-efficacy concepts and self-efficacy for exercise increased from baseline to completion of the study. A recent meta-analysis of exercise adherence in HF identified self-efficacy as one of the most widely applied theories of behavior change (Barbour & Miller, 2008). Results from this study support the incorporation of adherence strategies designed to foster exercise self-efficacy.

Application to Practice

The adherence strategies used in the EAMP are applicable to combined exercise programs for patients with HF. Group sessions were the highest rated strategy for both helpfulness in exercising and for building exercise self confidence. Group support may increase patients' confidence when peers share their exercise experience. Shared experiences may help patients form realistic expectations of exercise programs which may support adherence. Group sessions may be most helpful to patients during the self-managed phase of exercise when patients may trend down in exercise frequency. Group support sessions can be

integrated into exercise training programs and can be provided by cardiology clinics as a way to educate and monitor patients with HF learning to exercise.

Graphic feedback and goal setting were also rated high for helpfulness and self-efficacy. Feedback and goals for exercise are clarified by graphs. Graphic feedback is personalized to the individual's past behavior. This type of feedback has the potential to be most effective in behavior change because it is directly relevant to the individual (DiClemente, et al., 2001). Graphs of exercise participation and goals can be included in exercise programs through the use of spreadsheet programs that automatically update graphs when new data are entered.

Heart rate monitor watches provide another form of feedback for patient to use in monitoring their response to exercise. The high ratings for the watches in this study indicate patients found the cardiac rate information useful when exercising. The heart rate watches may help reduce patient anxiety about cardiac function during exercise. The strong relationship between the watches and frequency of combined exercise in Phase 2 may indicate cardiac rate data is more valued during unsupervised, self-managed exercise.

Heart rate watches and graphs provide feedback that heightens awareness of exercise response which can facilitate self-regulation skills. These strategies support the relationship between health care professional and patient. They provide objective data that health care professionals can use for individualized problem-solving and modifying exercise programs.

All of the strategies were available via the web-site but the low ratings for this strategy for helpfulness and for fostering confidence to exercise indicated it was not seen as useful. This may be because few patients accessed the web-site. Less than 50% of patients accessed the site outside of the group instructional sessions. Reasons for low access were not addressed in this study and further study is needed on ways to design web-based support for exercise adherence in HF.

Study Limitations

A small, convenience sample and a time period of six months are limitations of this study. Results must be generalized with caution, as study participants may have been more motivated than HF patients who do not consent to participate in an exercise protocol. Without a control group whose exercise behaviors were also measured, it is not possible to evaluate the extent to which adherence levels are uniquely attributable to the EAMP. Adherence in the study was measured by self-reports of exercise, a common measurement method, that is open to potential biases. Patient use of each strategy was not monitored during the self-management phase and this study was not able to isolate the effect of each strategy on exercise adherence. Findings support the use of a combination of adherence strategies and preclude identification of which strategy is most effective.

Conclusions

This study is one of few to trend weekly adherence for both resistance and aerobic exercise and to measure adherence to the exercise components of duration and intensity. Despite a challenging exercise protocol involving two type of exercise on 5 days/week, patients participating in the EAMP met on average 75% of frequency goals and 105% of duration and intensity goals, although frequency declined for both types of exercise in the self-management phase. Patients improved in exercise self-efficacy and rated 4 of 5 strategies from the EAMP as helpful to exercise and contributing to confidence for future exercise.

The EAMP holds promise as an approach to the management of adherence in combination aerobic and resistance exercise programs for patients with HF who have no recent exercise

experience. Heart failure adds challenges to adapting to a long-term exercise program and the EAMP may help patients persist in exercise long enough to realize benefits. The decline in participation noted during the self-management phase of the EAMP suggests that 12 weeks of support may not be long enough for patients with HF to transition to self-managed exercise.

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Figure 1.
Mean weekly frequency for aerobic and resistance exercise

Figure 2.
Mean Strategy Rating for Self-efficacy and Helpfulness

Table 1

Application of self-regulation concepts of self-efficacy to EAMP strategies

Strategy	Description of use	Self-efficacy component for self-regulation
Exercise logs Included section to report symptoms experienced with exercise	Patients completed weekly: aerobic frequency, duration, and intensity, and resistance frequency Phase 1: provided to patients Phase 2: available at exercise site and on web-site	Self-monitoring Self-appraisal of exercised induced physiological responses
Heart rate monitor watch Chest straps provided if requested)	Phase 1 and 2: patients monitored heart rate during exercise	Self-monitoring, feedback Self-appraisal of exercise induced physiological responses
Group support sessions Small, cohort (n=6-8) group support sessions	Phase 1: weekly or bi-weekly meetings with cohorts and investigators on exercise experience, and for positive feedback and problem-solving Phase 2: able to contact other members	Relapse management, Vicarious learning, Positive verbal feedback by investigators and group members
Goal setting and graphs feedback Exercise participation graphs in comparison to goals	Weekly bar graphs of past session frequency, mean duration, and intensity in comparison to goal (line). Phase 1: provided and reviewed every 3 weeks Phase 2: available at exercise site and on web-site	Goal setting Feedback Self-monitoring
Internet web-site Links for educational information, exercise logs, personal exercise graphs and contact information for study personnel, clinic, and group members	Patients given individual log-in and password. Phase 1: practice conducted at group sessions Phases 1 and 2: web-site available and monitored and individual responses provided	Self-monitoring Goal setting Feedback Vicarious learning

Table 2

Mean (SD) adherence outcomes for Phase 1 and Phase 2 (n=20)

	Goal	Phase 1 Wks 1 - 12	Phase 2 Wks 13 - 24	p ^a	Wks 1-24
Aerobic Exercise	Frequency				
	Total sessions	31.1 (7.0)	21.8 (12.7)	.001	53.1 (17.3)
	Sessions/wk	2.6	1.8		2.2
Duration	Goal achievement	86.3%	60.4%		73.8%
	Mins/session	31.0 (2.9)	32.2 (9)	.441	31.7 (5.9)
	Goal achievement	103.5%	107.3%		105.5%
Intensity	RPE rating	12.1(0.5)	12.2 (0.7)	.402	12.2 (0.6)
	Goal achievement	105.1%	105.9%		105.7%
	Total sessions	21.4 (3.0)	16.0 (8.7)	.013	37.4 (11.6)
Resistance Exercise	Sessions/wk	1.8	1.3		1.6
	Goal achievement	89.2%	66.5%		77.8%
	Total sessions	52.5 (9.1)	38.8 (21)	.002	90.5 (29.5)
Combined Exercise	Sessions/wk	4.4	3.1		3.8
	Goal achievement	87.4%	62.8.7%		75.4%

^a probability from paired t-test

Table 3

Correlations for strategy ratings of helpfulness and self-efficacy and combined (aerobic and resistance) exercise sessions by phase

Strategy	Rating Helpfulness Self-efficacy	Phase 1 Weeks 1-12	Phase 2 Weeks 13-24
Exercise logs	Helpfulness	-.16	.01
	Self-efficacy	-.20	.11
Heart rate watch	Helpfulness	-.13	.25
	Self-efficacy	.29	.47*
Group support sessions	Helpfulness	-.37	-.48*
	Self-efficacy	-.26	.02
Goals and graphic feedback	Helpfulness	.32	.19
	Self-efficacy	.12	.28
Internet web-site	Helpfulness	.07	.11
	Self-efficacy	-.08	.03

*
 $p < 0.05$