Effects of cardiac rehabilitation on functional capacity and quality of life in patients with normal and impaired left ventricular function
Nieuwland, Wybe

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Chapter 7
Change in self-efficacy during cardiac rehabilitation and the role of perceived overprotectiveness

M.A. Berkhuisen\textsuperscript{1,3}
W. Nieuwland\textsuperscript{2,3}
B.P. Buunk\textsuperscript{4}
R. Sanderman\textsuperscript{5}
P. Rispens\textsuperscript{1}

\textsuperscript{1}Department of Human Movement Sciences, University of Groningen, the Netherlands
\textsuperscript{2}Beatrixoord Cardiac Rehabilitation Center, Haren, the Netherlands
\textsuperscript{3}Department of Cardiology, University Hospital Groningen, the Netherlands
\textsuperscript{4}Department of Psychology, University of Groningen, the Netherlands
\textsuperscript{5}Northern Center for Healthcare Research, University of Groningen, the Netherlands

ABSTRACT

Self-efficacy (SE) is an important outcome following cardiac rehabilitation (CR) when claiming benefits to patients and improving existing programs. This study evaluated change in SE during 6 weeks of multidisciplinary CR with either a high or low-frequency exercise training program. The role of overprotectiveness of the spouse, as it potentially counteracts improvement in SE, was examined. Coronary patients (n=114) were randomized into both types of program. Overprotectiveness (patient perception) was assessed prior to rehabilitation. Self-efficacy in the domains controlling symptoms (SE-CS) and maintaining function (SE-MF), were assessed prior to and immediately after rehabilitation. Three findings pertain to program improvement: (1) As predicted, the low-frequency program enhanced SE-CS more than the high-frequency program, suggesting that experiencing success in daily activities and active engagement of the patient seem more decisive factors in improving SE than the frequency of exercise. (2) Changes in SE in both programs fell short of clinical meaning, suggesting the need to use self-efficacy theory more vigorously. (3) Overprotectiveness significantly predicted adverse change in SE in the high-frequency program, suggesting the need to include counseling for cardiac couple in CR when applicable.
Will I be able to do strenuous exercise?...to return to work?...to control feelings of chest pain? These kinds of questions reflect practical concerns of many patients after myocardial infarction or other major coronary events. The subsequent judgments that these patients make about their capabilities to actually perform one of these tasks or behaviors, has been designated by Bandura as their perceived self-efficacy. How such self-efficacy beliefs are affected during cardiac rehabilitation including the role of perceived overprotectiveness, is addressed in this paper.

Cardiac rehabilitation has largely evolved as a multifactorial service, assisting patients in resuming and maintaining life as normally as possible. Rather than exercise conditioning only, rehabilitation programs today include interventions also aimed at psychosocial counseling, and modifications of coronary risk factors and behaviors. In the recent past, numerous studies have been conducted to evaluate positive effects of these programs. As a result, cardiac rehabilitation has gained widespread support as an important component of the care plan for coronary patients. Most often, effects of cardiac rehabilitation have been documented in terms of functional capacity, clinical or behavioral characteristics, psychosocial well-being, subjective health status, or returning to work. Self-efficacy as an outcome measure has received considerably less attention thus far. However, from at least two perspectives, self-efficacy is an important outcome measure in cardiac rehabilitation. The first perspective refers to the predictive value of self-efficacy on recovery behaviors and outcomes. According to Bandura’s self-efficacy theory, decisions that people make about whether or not to attempt certain courses of action and about how long to pursue them, are to an important extent determined by judgments of personal efficacy. It is well established that these judgments of capabilities consistently predict subsequent health related outcomes (e.g. smoking, pain management, exercise). The predictive value of self-efficacy has also been demonstrated in the area of recovery from coronary events. Self-efficacy estimates were shown to be better predictors of return to work, physical functional status and use of pain medication than was age or medical status. Ewart and co-workers showed that changes in patients’ jogging self-efficacy scores immediately following a treadmill exercise test predicted changes in their home activity levels better than did peak heart rate and maximal energy expenditure level achieved during the exercise test. Finally, lack of self-efficacy proved to predict overexertion during prescribed exercise training, suggesting that self-efficacy judgments are important independent predictors of behavioral compliance with exercise guidelines. Thus changes in self-efficacy beliefs stimulate changes in desired recovery behaviors that benefit patients and, as such, are important outcomes of cardiac rehabilitation.

The second perspective supporting the need to include self-efficacy as an outcome measure is that, in fact, most cardiac rehabilitation programs explicitly employ strategies enhancing patients’ self-efficacy which calls for a subsequent evaluation of its effect. Self-efficacy theory, briefly, asserts that personal efficacy is based on four major sources of information: performance accomplishments, social modeling, verbal persuasion by a respected authority, and internal feedback from one’s physiological state. Relying on the extensive literature on coronary patients, investigators have described how nurses or other cardiac rehabilitation practitioners can utilize self-
efficacy theory to achieve predetermined rehabilitation goals.\textsuperscript{12-15} Jeng and Braun\textsuperscript{13} even explicitly suggested that self-efficacy theory might serve as a theoretical framework in cardiac rehabilitation programs. Similarly, Ewart\textsuperscript{12,16} stated that the four sources of self-efficacy information are key components of a well-designed cardiac rehabilitation program and may constitute the most important benefit the program provides.

However, while the rehabilitation team may explicitly attempt to enhance patients’ sense of self-efficacy, the observed magnitude of change in self-efficacy may be confounded by factors other than the program activities. Identifying possible factors that influence patients’ sense of self-efficacy during rehabilitation is essential to a proper interpretation of the rehabilitation outcomes and thus useful for future program improvement.\textsuperscript{17} One such factor, which may influence a patient’s self-efficacy during cardiac rehabilitation, is overprotective behavior of the spouse. It has been noted that, following a major cardiac event, spouses of patients may become intrusive and restrictive and may do things that patients can do for themselves.\textsuperscript{18} There is some evidence of the significant undermining effect that such overprotective behavior has on patients’ sense of self-efficacy. Coyne and Smith\textsuperscript{19} studied 53 couples in which the husband of each pair had experienced an uncomplicated myocardial infarction (MI) an average of 6 months earlier. They demonstrated an independent adverse association between spouses’ report of being overprotective and patients’ report of their senses of self-efficacy. On the other hand, a recent study of Clarke, Walker and Cuddy\textsuperscript{20} failed to demonstrate a significant relationship between patients’ self-efficacy and overprotectiveness as measured 3 months after MI. The results did support the notion that perceived overprotectiveness is a negative experience for patients, but it did not appear to be significantly related to their senses of self-efficacy. So far, research has not addressed as to whether overprotectiveness predicts change in self-efficacy during the course of cardiac rehabilitation.

\textit{Research questions}

The present study evaluated outcomes of a high-frequency and a low-frequency exercise training program as part of a 6-week outpatient (phase II) multidisciplinary cardiac rehabilitation program. Hence, to contribute to a thorough understanding of the benefits of both types of programs and in the interest of improving these existing programs, changes in patients’ self-efficacy beliefs were assessed and the role of overprotectiveness was examined. Specific research questions that were addressed include:

1. What is the effect of both types of program on self-efficacy, and how clinically meaningful are the changes in self-efficacy?
2. Is there a difference between the rehabilitation programs in effect on self-efficacy?
3. Does overprotectiveness predict adversely change in self-efficacy following both types of program?

Hypotheses are formulated for research questions number two and three.

A difference in effect on self-efficacy between these programs is expected; the low-frequency exercise training program is hypothesized to generate significantly more enhancement in patients’ self-efficacy beliefs than the high-frequency exercise training
program. This hypothesis is based on two assumptions. The first is derived from an earlier suggestion by Oldridge and Rogowski. They demonstrated little change in self-efficacy scores with in-hospital (phase I) rehabilitation before hospital discharge, but significantly improved scores 28 days after discharge. The authors suggested the improved self-efficacy scores after discharge to be largely associated with the resumption of usual daily activities. Translated to the issue of high versus low-frequency rehabilitation, unlike patients in high-frequency exercise training program who visit the rehabilitation center full-time during the week, patients in the low-frequency program visit the rehabilitation center only part-time. As such, the low-frequency program does offer the opportunity to effectively implement recovery behaviors within daily life during the rehabilitation period. That, in turn, might best foster ‘performance accomplishments’, in terms of sources of information to boost self-efficacy beliefs. In other words, self-efficacy beliefs in low-frequency patients are more likely to be enhanced because of a joint effect of the rehabilitation itself with the possibility to experience success in one’s own setting, which is the ultimate goal for patients. Based on clinical experience, the second assumption is that a part-time, low-frequency exercise training program generates in patients more understanding of their own responsibilities, resulting in more active engagement in learning about recovery behaviors. Patients in the full-time, high-frequency exercise training program, on the other hand, are in the rehabilitation environment for the whole day, following enforced exercise prescriptions. These patients likely develop a more dependent attitude, are more likely to credit their achievements to external factors such as the doctor, staff, or the program, limiting thereby gains in self-efficacy.

In line with the assumption that patients in the high-frequency program develop a more dependent attitude, it is further hypothesized that perceived overprotectiveness adversely affects a change in self-efficacy in the high-frequency program, but not in the low-frequency program. Patients who develop a more dependent attitude are anticipated to be more prone to any influence from the spouse resulting in less improvement in self-efficacy, than those who develop a more independent attitude and rely upon their own feelings and experiences.

METHODS

Study design and patients

The data are derived from a clinical trial in which 130 coronary patients were randomized into either a high-frequency or low-frequency exercise training program as part of a 6-week multidisciplinary cardiac rehabilitation program. Participation in the study required manifest coronary artery disease and 30 to 70 years of age. Exclusion criteria were uncompensated heart failure; unstable arrhythmias; unstable angina; contra-indication for exercise training; exercise training limiting concurrent condition; inability to complete questionnaires. Baseline characteristics, overprotectiveness and self-efficacy were assessed during a 3-day screening period before rehabilitation (T1). Exercise capacity was then determined by performing a symptom-limited graded
exercise test and reported as peak oxygen uptake (peak \( V_{O2} \)). Left ventricular (LV) resting ejection fraction was obtained by performing echocardiograms. Self-efficacy was reassessed at the end (T2) of rehabilitation (i.e. after 6 weeks). Four patients (all from the low-frequency program) stopped with rehabilitation for various non medical reasons. Ten patients were excluded from follow-up analyses for various reasons; 5 from the high-frequency and 5 from the low-frequency program (e.g. bypass surgery or coronary angioplasty during rehabilitation, not willing to complete repeated questionnaires) and 5 patients had some missing data for the variables of interest in this study. Hence, in this study, we limited attention to 111 patients.

**Rehabilitation programs**

The two programs being evaluated are both a 6-week cardiac rehabilitation program with a multidisciplinary approach offering the same set of components. The programs basically differ in the frequency of exercise training per week, whereas other components are equal for all patients. Patients randomized into the high-frequency exercise training attended the rehabilitation center 5 full-days per week for 6 consecutive weeks. Exercise sessions were held twice a day. Patients enrolled in the low-frequency exercise training program attended the rehabilitation center 2 half-days per week for six consecutive weeks. Exercise sessions were administered twice a week.

One exercise training session included 60 minutes of sports (e.g., volleyball, ballsports, calisthenics) in a group of 6 to 12 patients and a physical training on a cycle ergometer with continuous electrocardiographic (ECG) monitoring. Duration of cycling was 25 minutes in a group of 3 to 6 patients. The intensity of training was individually prescribed and based on a training heart rate derived from the initial exercise test. All exercise sessions were supervised by at least two practitioners. Components other than exercise training included:

1. Relaxation instructions, offered once a week in a 30-minute group session which consisted of several procedures for body and breathing awareness;
2. Individual psychosocial counseling by a psychologist or social worker (when necessary), scheduled between exercise sessions;
3. Individual dietetic counseling and modification by a dietitian (when necessary), scheduled between exercise session;
4. Education and information about the function of the heart, coronary artery disease process and its treatment, risk factors, emotional reactions to heart disease, stress management and exercise guidelines.

The various topics were addressed separately in classes of 3 to 8 patients. The classes were structured in 2 whole days. Spouses were also encouraged to attend the education and information classes.

Rehabilitation was explicitly aimed at enhancing patients’ sense of self-efficacy, by incorporating the sources that influence self-efficacy. For example:

1. When necessary, the rehabilitation team guided the patients in reinterpreting physiological signs and symptoms allowing them to view these signs and symptoms more accurately.
2. Prescribing the intensity of exercise training individually and monitoring of patients’
ECG prevents patients from exceeding their physical limitations. This, in turn, prevents patients of developing a feeling of being not capable of performing strenuous exercise.

3 Persuasion by the rehabilitation team was used to get patients to believe they have the capability to attain certain goals (when realistic).

4 Allowing patients to see how others are doing with the same problem, exercise and education sessions were always offered in a group and, in addition, patients were encouraged to rest in a special designated room together with fellow patients in between the exercise sessions.

**Rehabilitation outcome; Self-efficacy**

A Dutch translation was used of an earlier version of the Cardiac Self-efficacy Questionnaire which was recently developed and extensively described elsewhere. In this version, three items were omitted (i.e., “How confident are you that you can control your breathlessness by taking your medications”; “How confident are you that you can control your breathlessness by changing your activity levels”; “How confident are you that you can maintain your sexual relationship with your spouse”). Based on our data, the same statistical procedures were employed revealing similar results. That is, principal factor analyses explained 53.6% of the item variance and confirmed the same two subscales: Controlling symptoms (SE-CS, 6 items) and Maintaining Function (SE-MF, 4 items).

Examples of items for the SE-CS subscale are:
1 “How confident are you that you can control you chest pain by changing your activity levels”.
2 “How confident are you that you know how much physical activity is good for you”.

Examples of items for the SE-MF subscale are:
1 “How confident are you that you can maintain your usual activities at work”.
2 “How confident are you that you can get regular aerobic exercise (work up a sweat and increase your heart rate)”.

Patients were asked to rate their confidence regarding each of the statements on a 5 point Likert scale ranging from ‘not at all confident’ (1) to ‘completely confident’ (5). Cronbach’s alphas were satisfactory: .72 and .81 for SE-CS and SE-MF respectively.

**Baseline overprotectiveness**

Overprotectiveness was measured by a self-developed Dutch questionnaire measuring overprotectiveness of the spouse as perceived by the patients, which was based on data derived from the present randomized clinical data, validated and extensively described in a previous paper. The scale consisted of six items. Examples of items are: “My spouse continuously keeps an eye on me”, “My spouse treats me like a little child”, and “When it comes down to it, my spouse seems to think that I do not know what good is for me”. Patients could give their answers on a five point scale running from ‘all the time’ (1) to ‘never’ (5), or ‘very much’ (1) to ‘not at all’ (5) where appropriate. All answers were recoded such that a higher score denotes more perceived overprotectiveness. Cronbach’s alpha of the subscale was satisfactory: .77.
Statistical Analyses

To identify any differences between groups as baseline, characteristics of both groups were compared with an independent t test in case of variables of interval level and with a chi-square analysis in case of variables of nominal or ordinal level. Pairwise t test was used to identify significant changes in the self-efficacy subscales for both programs separately. To compare changes in self-efficacy between both programs, analyses of covariance were employed for each self-efficacy subscale separately, using the baseline score as a covariate. Effect sizes were used to assess the magnitude of changes in self-efficacy beliefs in both programs.\textsuperscript{25,26} Unlike the level of significance, the level of effect size refers to the size of a change and assists in interpretation of the clinical importance; that is, effect size estimates allow a stronger sense of the clinical meaning of changes. Effect size estimates were calculated by taking the difference between the mean entry and end score and dividing it by the pooled standard deviation from both groups at baseline. Following Cohen, effect sizes of 0.20 are defined as small change, of 0.50 as moderate change, and of 0.80 or greater as large change. To determine the predictor quality of T1 perceived overprotectiveness on T2 self-efficacy beliefs, multiple stepwise regression analyses were employed for each program separately. In the first step, T1 self-efficacy score was forced in the equation. Next, the following biomedical variables were entered; gender, age, exercise capacity, and LV ejection fraction. In the final step, perceived overprotectiveness was allowed to enter.

<table>
<thead>
<tr>
<th></th>
<th>High-frequency Patients</th>
<th>Low-frequency Patients</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (years)</td>
<td>52.1 (9.4)</td>
<td>52.6 (9.5)</td>
<td>NS</td>
</tr>
<tr>
<td>Gender</td>
<td></td>
<td></td>
<td>NS</td>
</tr>
<tr>
<td>Male</td>
<td>47 (82%)</td>
<td>47 (87%)</td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>10 (18%)</td>
<td>7 (13%)</td>
<td></td>
</tr>
<tr>
<td>Married or stable relationship</td>
<td>44 (77%)</td>
<td>43 (80%)</td>
<td>NS</td>
</tr>
<tr>
<td>Exercise capacity</td>
<td></td>
<td></td>
<td>NS</td>
</tr>
<tr>
<td>(Peak-V02 ml/min/kg)</td>
<td>22.6 (6.4)</td>
<td>22.8 (9.8)</td>
<td></td>
</tr>
<tr>
<td>LV Ejection Fraction</td>
<td>.47 (.10)</td>
<td>.45 (.09)</td>
<td>NS</td>
</tr>
<tr>
<td>Coronary diagnosis</td>
<td></td>
<td></td>
<td>NS</td>
</tr>
<tr>
<td>Myocardial infarction</td>
<td>42 (73%)</td>
<td>39 (72%)</td>
<td></td>
</tr>
<tr>
<td>Angina</td>
<td>3 (5%)</td>
<td>8 (15%)</td>
<td></td>
</tr>
<tr>
<td>Bypass surgery</td>
<td>6 (11%)</td>
<td>2 (4%)</td>
<td></td>
</tr>
<tr>
<td>PTCA</td>
<td>6 (11%)</td>
<td>5 (9%)</td>
<td></td>
</tr>
</tbody>
</table>

\textit{Table 1. Baseline characteristics of high-frequency (n=57) and low-frequency patients (n=54).} Note. Mean and standard deviation or number and percentage of patients, where appropriate. NS = difference not statistically significant; PTCA = percutaneous transluminal coronary angioplasty; LV = left ventricular
RESULTS

Comparability of the groups  
Baseline characteristics regarding demographic and clinical characteristics are presented in table 1 and demonstrate no statistical differences between high and low-frequency groups.22 Also, no significant differences between rehabilitation groups were observed regarding self-efficacy beliefs.

Self-efficacy changes with rehabilitation  
Table 2 summarizes average changes in self-efficacy and effect size scores following six weeks of rehabilitation. Patients in the low-frequency program reported significantly improved self-efficacy beliefs for maintaining function, as well as for controlling symptoms. Patients in the high-frequency program, instead, reported significantly enhanced self-efficacy beliefs for maintaining function, but not for controlling symptoms. Effect size scores ranged from 0.18 to 0.61, indicating small to moderate changes in self-efficacy in either type of program at most.

Comparing changes between rehabilitation programs, analysis of covariance yielded a marginally significant main effect for the type of program for the self-efficacy scale ‘controlling symptoms’ (P =.062), indicating that the low-frequency program generated a greater effect than the high-frequency program. Regarding change in self-efficacy beliefs for maintaining function, no statistically significant difference was observed between rehabilitation programs.

Overprotectiveness and change in self-efficacy  
Stepwise regression analysis were employed for each program and subscale of self-efficacy separately to determine the predictor quality of overprotectiveness on change in self-efficacy (tables 3 to 6).

For the high-frequency program, in the successive steps entered in the equation, 42% of the variance in T2 self-efficacy to control symptoms was explained. When

<table>
<thead>
<tr>
<th>Self-efficacy Scale</th>
<th>T1</th>
<th>T2</th>
<th>Change</th>
<th>P value</th>
<th>ES</th>
<th>Program effect (ANCOVA)</th>
</tr>
</thead>
<tbody>
<tr>
<td>SE-CS</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>High-frequency</td>
<td>24.0 (3.5)</td>
<td>24.5 (3.4)</td>
<td>+0.5</td>
<td>0.385</td>
<td>0.18</td>
<td>F=3.55</td>
</tr>
<tr>
<td>Low-frequency</td>
<td>24.2 (2.8)</td>
<td>25.5 (2.7)</td>
<td>+1.4</td>
<td>0.003</td>
<td>0.61</td>
<td>P=0.062</td>
</tr>
<tr>
<td>SE-MF</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>High-frequency</td>
<td>15.0 (2.8)</td>
<td>15.7 (2.6)</td>
<td>+0.7</td>
<td>0.028</td>
<td>0.37</td>
<td>F=0.52</td>
</tr>
<tr>
<td>Low-frequency</td>
<td>15.5 (2.6)</td>
<td>16.3 (2.5)</td>
<td>+0.8</td>
<td>0.008</td>
<td>0.52</td>
<td>P=0.469</td>
</tr>
</tbody>
</table>

Table 2. Mean scores for self-efficacy scales before (T1) and after rehabilitation (T2), for the high (n=57) and low-frequency program (n=54).  
Note. Higher scores denote a better sense of self-efficacy. SE-CS = Self-efficacy for controlling symptoms; SE-MF = Self-efficacy for maintaining function; ES = Effects size score; ANCOVA; Analysis of covariance
controlling for the T1 self-efficacy score and biomedical variables, perceived overprotectiveness contributed significantly in the final step ($P = .03$) (table 3). A negative association appeared, indicating that as patients perceived themselves to be more overprotected, they showed less improvement in self-efficacy. Regression on T2 self-efficacy beliefs for maintaining function yielded an explained variance of 45% and a marginally significant contribution of overprotectiveness ($P = .08$) (table 4). Notably, a positive relationship was observed, indicating that as patients perceived themselves to be more overprotected by their spouses, they showed more improvement in self-efficacy.

For the low-frequency program, in the successive steps entered in the equation, only 25% of the variance in T2 self-efficacy beliefs to control symptoms was explained (table 5). Perceived overprotectiveness contributed negatively, though not significantly.

### Table 3. Regression of T2 (after rehabilitation) self-efficacy for controlling symptoms on T1 (baseline) variables for patients enrolled in the high-frequency rehabilitation program ($n=44$).

<table>
<thead>
<tr>
<th>Step</th>
<th>T1 Predictor</th>
<th>Cum $R^2$</th>
<th>F</th>
<th>SigF</th>
<th>Change $R^2$</th>
<th>F Change</th>
<th>SigF Change</th>
<th>Beta</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>SE-CS</td>
<td>.25</td>
<td>14.1</td>
<td>.00</td>
<td>.09</td>
<td>1.3</td>
<td>.25</td>
<td>.47</td>
</tr>
<tr>
<td>2</td>
<td>Biomedical variables</td>
<td>.34</td>
<td>4.0</td>
<td>.00</td>
<td>.08</td>
<td>5.1</td>
<td>.03</td>
<td>-.28</td>
</tr>
<tr>
<td></td>
<td>Gender</td>
<td></td>
<td></td>
<td></td>
<td>.18</td>
<td>.10</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Age</td>
<td></td>
<td></td>
<td></td>
<td>.10</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Peak-V0$_2$</td>
<td></td>
<td></td>
<td></td>
<td>-.08</td>
<td>.09</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>LV-EF</td>
<td></td>
<td></td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>

Note. In the regression analysis, only those patients were included with a score on perceived overprotectiveness, thus with a spouse. Gender is coded as 1=male; 2=Female. Other variables; higher scores denote more of the variable. SE-CS = Self-efficacy for controlling symptoms; Peak V0$_2$ = Peak oxygen consumption (measure of exercise capacity); LV-EF: Left ventricular ejection fraction (measure of cardiac function)

### Table 4.

Regression of T2 (after rehabilitation) self-efficacy for maintaining function on T1 (baseline) variables for patients enrolled in the high-frequency rehabilitation program ($n=44$)

Note. See Table 3.

SE-MF = Self-efficacy for maintaining function
Regression on T2 self-efficacy beliefs for maintaining function yielded an explained variance of 49% (table 6). Again, a negative though not significant contribution of perceived overprotectiveness was observed.

**DISCUSSION**

This study describes changes in self-efficacy during cardiac rehabilitation and the role of perceived overprotectiveness. Three findings pertain to program development in cardiac rehabilitation (table 7).

First, the hypothesis that the low-frequency would generate more improvement in self-efficacy than the high-frequency exercise training program was partly confirmed.
A difference in effect between the two programs on patients’ self-efficacy to maintain function was not found. However, as expected, a statistical, though marginal, difference in effect on patients’ self-efficacy to control symptoms was found between both programs; low-frequency patients reported greater improvement in self-efficacy beliefs to control symptoms than did high-frequency patients. As a matter of fact, improvement in high-frequency patients in self-efficacy to control symptoms was not even statistically significant. These results suggest the following interesting interrelationship between exercise training and self-efficacy. Most patients feel unsure about physiological signs and symptoms and about how much physical exertion is allowed, and thus whether they can maintain daily activities. Exercise training, based on individual prescriptions and with continuous monitoring of patient’s electrocardiogram (ECG) has been generally believed to be the appropriate intervention to overcome such uncertainties and to boost patients’ self-efficacy. However, the present study results show no advantageous effect of an increased frequency of exercise training, even more so, low frequency exercise training was more beneficial. If the underlying assumptions are correct, this finding suggests that, active engagement of the patient during exercise training, and the possibility of experiencing success in daily activities are more decisive factors in enhancing patients’ self-efficacy than the frequency of training.

It should be noted that minor effects with regard to the influence of exercise training on improvement of physical self-efficacy have also previously been identified by Gulanick, so far the only other investigator who has assessed changes in self-efficacy following outpatient cardiac rehabilitation. She compared effects in physical self-efficacy between two different outpatient cardiac rehabilitation programs and routine care. Outpatient programs consisted of exercise testing and education, either with or without exercise training. Substantial improvements were observed in all three groups, but the study failed to demonstrate a significant advantage for either type of cardiac rehabilitation treatment over routine care, nor did it demonstrate a significant difference between rehabilitation programs as a function of exercise training. Findings were explained as being due to the earlier impact of in-hospital rehabilitation, small sample size, and selected eligibility criteria and inadequate questionnaires. Such methodological issues may indeed affect findings. As for the present study, the interpretation that there was a minor effect of increased frequency of exercise training

<table>
<thead>
<tr>
<th>Table 7. Practice implications for improving cardiac rehabilitation programs</th>
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</thead>
<tbody>
<tr>
<td>1. The possibility of experiencing success in daily activities and active engagement of the patient during rehabilitation, are more decisive factors in enhancing patients’ sense of self-efficacy than the frequency of exercise training.</td>
</tr>
<tr>
<td>2. Systematic planning of specific strategies enhancing patients’ self-efficacy demands an evaluation of actual implementation during rehabilitation.</td>
</tr>
<tr>
<td>3. Because overprotectiveness may counteract improvement in patients’ self-efficacy, rehabilitation programs should include the possibility of counseling couples. Counseling, for example, may be aimed at eliminating the overprotective behavior of the spouse or assisting cardiac couples in understanding each other’s behavior.</td>
</tr>
</tbody>
</table>
was based upon considering differences between both programs in the employment of
the self-efficacy theory during exercise.

The second observation that pertains to program development in cardiac
rehabilitation deals with the impact on self-efficacy of either type of program; they both
fell short of the desired effect on self-efficacy beliefs. This is evident in the high-
frequency program for self-efficacy beliefs to control symptoms since change in this
subscale failed to reach statistical significance. Other self-efficacy changes, on the
other hand, were statistically significant. However, effect sizes were included to
supplement statistical significance in interpreting the results; obtained scores ranged
from 0.18 to 0.61 indicating only small to moderate clinically meaningful changes.
Why did both programs fail to optimally enhance patients’ confidence in performing
different recovery behaviors? Possibly because the Cardiac Self-efficacy Questionnaire
was not sufficiently sensitive to detect changes in self-efficacy beliefs. However,
anecdotal reports of patients indicating their satisfaction with the questionnaire, suggest
this instrument to be appropriate. It is also possible that some patients have participated
in an in-hospital rehabilitation program prior to entering in this study. Gulanick²⁷
suggested that an in-hospital program may have positively influenced patients’ self-
efficacy, thereby limiting the effect of a subsequent outpatient rehabilitation program.
This explanation does also not fully satisfy the lack of statistically and clinically
significant changes found in this study; the mean self-efficacy scores before
rehabilitation (as shown in table 2) indicate that not all patients reported total
confidence regarding the two self-efficacy domains, leaving room for improvement. We
believe that an inadequate use of self-efficacy theory is the reason for the modest
effects. In other words, although the programs under study were aimed toward
enhancing patients’ self-efficacy, specific strategies planned may not have been
employed.²⁸ For example, counseling of the patients during exercise may not have been
so adequate as planned. Counseling refers to employment of sources of self-efficacy
information as outlined earlier, for example, providing adequate feedback about one’s
improved performance during exercise, or assisting patients in interpreting any
physiological changes. This important clinical issue has already been raised by Gillis et
al.²⁹ After concluding a minor effect of their study intervention on changing levels of
self-efficacy for lifting, climbing and working, they considered the possibility that the
treatment approach was not so vigorous in the use of self-efficacy enhancement as had
been planned. The authors hoped that clinically based investigative teams would
attempt to replicate these findings, implementing a more intensive approach to self-
efficacy enhancement. In any case, findings of the present study warrant the
multidisciplinary rehabilitation team to further consider the crucial issues that hinder
optimal program success in enhancement of self-efficacy beliefs.

One such issue, which may hinder enhancement of self-efficacy during
rehabilitation, is addressed in the final observation that pertains to program
development: the role of perceived overprotectiveness. As expected, it appeared that
perceived overprotectiveness had a significant undermining effect on improvement in
self-efficacy beliefs to control symptoms in patients enrolled in the high-frequency
program, but not in the low-frequency program. Thus, the fact that the high-frequency
program failed to generate a significant change in patients’ sense of self-efficacy to control symptoms can partly be explained by them feeling overprotected. In this case, the practical implication is that cardiac rehabilitation should include interventions that either eliminate the overprotective behavior of the spouse, or at least assist couples in understanding each other’s behavior.\textsuperscript{30} Also, as expected, a significant, though marginal, association was found between perceived overprotectiveness and change in self-efficacy for maintaining function in the high-frequency program, but not in the low-frequency program. However, unexpectedly, this association proved to be positive. Together, the findings that perceived overprotectiveness significantly influenced change in either self-efficacy measure in the high-frequency program - but not in the low-frequency program - confirm the hypothesis that patients in the high-frequency program are more prone to any influence of the spouse than low-frequency patients. However, the positive association between overprotectiveness and self-efficacy beliefs to maintain function in the high-frequency program is noteworthy. In fact, this finding is somewhat puzzling on the one hand, though intriguing on the other hand. The literature on overprotectiveness among cardiac couples is inconclusive about the direction of the effect of overprotectiveness on measures such as anxiety and depression. That is, research has shown harmful effects,\textsuperscript{20} but also beneficial effects.\textsuperscript{31} It has been suggested that this difference between results among investigators is due to a difference in definition and measurements of overprotectiveness.\textsuperscript{20,31} Clearly, this explanation does not apply to the differences in direction observed within the same study. One explanation could be that controlling symptoms is first and foremost an activity done by the patients themselves. For patients to develop confidence in their ability to control symptoms, intrusive behavior by the spouse may then have an undermining effect. Maintaining daily activities on the other hand, in fact, requires to some extent help and co-operation from others. For patients to develop confidence in maintaining daily activities, actual help from the spouse, even though intrusive, might then be beneficial.

In any case, the results of the present study indicate that how patients respond to perceived overprotectiveness may be contingent upon the dependent measure and is, at least partially, conditioned by the nature of the intervention in which they are participating. Apparently, patients respond differently to different rehabilitation programs, allowing a different role of perceived overprotectiveness. Future research on overprotectiveness should be directed toward identifying and understanding under which circumstances overprotectiveness is potentially harmful or beneficial in cardiac couples.

Self-efficacy was used as the outcome of interest following cardiac rehabilitation. It has to be noted that the concept of self-efficacy is very complex. In this study, patients’ confidence in maintaining function and controlling symptoms was measured. It is possible that a different conceptualization of self-efficacy would have led to different results. In fact, the same issue applies to the concept of overprotectiveness. However, our findings are interesting and certainly suggest the need of further elaboration of both concepts in cardiac rehabilitation research.
IMPLICATIONS AND CONCLUSIONS

By evaluating changes in self-efficacy immediately after intervention, it is uncertain how patients will respond in the long run. This information would be required when judging which program is most economically sound. However that was not the focus of this study. Rather, the present study aimed at enhancing our understanding about how to strengthen cardiac rehabilitation programs. In this case, the resulting feedback from immediate outcomes provides information to be used in developing an understanding of what goes on during cardiac rehabilitation. In most cardiac rehabilitation programs, exercise training is still the core component. However, the current results suggest that, for patients to strengthen their sense of self-efficacy, experiencing success in daily activities and active engagement during rehabilitation seem more decisive factors than the frequency of exercise training; that is, over a short 6-week multidisciplinary rehabilitation program, patients assigned to a low-frequency exercise training developed a greater sense of self-efficacy to control symptoms than those assigned to a high-frequency exercise training. Regardless, the impact of either type of program on self-efficacy fell short of clinical meaning. This does not mean that multidisciplinary cardiac rehabilitation is not justified. Rather, the real challenge to health care professionals is to consider further how to increase patients’ confidence in their ability to achieve different recovery outcomes and behaviors throughout the course of cardiac rehabilitation. In doing so, it appears crucial to take into account that the behavior of the spouse may impinge on patients when developing a sense of self-efficacy.

References