Effects of a self-regulation lifestyle program for post-cardiac rehabilitation patients

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Citation

Janssen, V. R. (2012, September 25). *Effects of a self-regulation lifestyle program for post-cardiac rehabilitation patients*. Retrieved from https://hdl.handle.net/1887/19850

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Title: Effects of a self-regulation lifestyle program for post-cardiac rehabilitation patients
Issue Date: 2012-09-25

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Changes in Illness Perceptions and Quality of Life During Participation in Cardiac Rehabilitation

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International Journal of Behavioral Medicine

Abstract

Background The beliefs patients hold about their disease and corresponding treatment have been shown to predict recovery in cardiac patients. However, it is not known to what extent these beliefs change during participation in cardiac rehabilitation and whether this is related to psychological indicators of outcome.

Method Illness perceptions and health-related quality of life (HRQOL) were measured upon entry to (T0) and completion of (T1) a three-month outpatient cardiac rehabilitation program in 158 cardiac patients.

Results Repeated measures ANOVA revealed that all illness perceptions other than timeline and personal control changed significantly over the course of cardiac rehabilitation. Overall, cardiac rehabilitation patients came to view their illness as more benign. Further analysis revealed that perceiving fewer emotional consequences of the illness, gaining a better understanding, and attributing fewer symptoms to the illness at the end of cardiac rehabilitation, was related to better HRQOL.

Conclusion Illness perceptions change during cardiac rehabilitation and these changes are associated with enhanced quality of life. Clinical trials have shown illness beliefs in cardiac patients to be modifiable during hospital admission; our results suggest that cardiac rehabilitation may provide a second window of opportunity during which illness perceptions can be actively monitored and modified if maladaptive.

Keywords Cardiac rehabilitation; Coronary heart disease; Illness perceptions; Quality of life

Introduction

Next to pharmacological therapies and interventional cardiology, cardiac rehabilitation (CR) programs are widely recognized as essential to the care of cardiac patients. CR programs aim to restore a patient to full physical and psychosocial functioning, and prevent recurrent cardiovascular events (1, 2). Core components of CR therefore include exercise training and psychoeducational programs that focus on education, lifestyle counseling and stress-management. Such programs have shown to be effective in reducing mortality, morbidity and risk factors, and in enhancing (health-related) quality of life (3-7). Quality of life is a broad concept that refers to a patient's subjective perception of the effect of the illness (and corresponding treatment) on physical, emotional and social domains of life (8). Although quality of life is an important construct in the evaluation of treatments, the construct is not derived from theory and, therefore, less attention has been paid to understanding how patients make quality-of-life judgments. Self-regulation theory offers a theoretical framework for understanding the (cognitive) processes underlying these value judgments. It argues that the beliefs patients hold about their illness and treatment are key determinants in how patients evaluate the effect of the illness on their lives (9). Leventhal's self-regulation model (10) classifies such beliefs, or illness perceptions, in seven domains: identity (the label and symptoms associated with the illness), timeline (perceptions about the duration and the course of the illness), consequences (the effects of the illness on the patient's life and daily functioning), the cause of the illness, illness coherence (the extent to which the patient feels he or she understands the illness), the amount of control the patient feels he or she has over the illness and the extent to which the patient perceives the treatment to help, and emotional representation (to what extent the patient is emotionally affected by the illness). Meta-analyses have acknowledged the link between illness perceptions and psychosocial adjustment across a range of diseases (11). In cardiac patients, positive illness perceptions (i.e., attributing fewer symptoms to the illness, perceiving fewer consequences, and experiencing a greater sense of control over the illness) have been associated with better quality of life (12,13). In contrast, pessimistic illness perceptions (i.e., serious consequences, a strong illness identity, and a chronic timeline, poor control) have been related to the onset of depressive symptoms (14-16).

Patients' self-evaluation of health and functioning is likely to change over time in response to changes in disease status or treatment. Not surprisingly, health-related quality of life in cardiac patients has been shown to change during the year following the cardiac event (17) with improvements being most apparent during the early phase of illness (i.e., hospital admission and CR) (18-20). Similarly, it has been argued that illness perceptions are also susceptible to change during this period, as patients continuously acquire new experiences and knowledge and will update their beliefs accordingly (21). In contrast, during the chronic phase of illness, illness perceptions are no longer directly challenged by changes in treatment or disease status, and likely to remain fairly stable (22). Nonetheless, there has been a paucity of research examining the changeability of illness perceptions over time. To our knowledge, there have been six such studies, the majority of which found illness perceptions to be relatively stable (22-24) or to show only small changes (25-27). Most of these studies, however, focused on patient groups for whom the acute nature of their illness had abated by the time of their participation in the study. Two studies on patients with myocardial infarction examined illness perceptions in hospital and four or twelve months after. Patients' perceptions of consequences and identity were found to be stable, but perceptions of control had worsened and the perception of duration of the disease had increased (26,27).

Tentative evidence suggests that illness perceptions are – at least in part – malleable during the acute illness phase. Petrie and colleagues showed that illness perceptions can be successfully altered during hospital admission (28,29). After receiving a brief intervention designed to change illness perceptions, patients viewed their illness as less threatening, i.e., they perceived fewer consequences, experienced greater (treatment) control over the illness and had a better understanding of their illness. Furthermore, patients felt better prepared to leave the hospital and returned to work more quickly (28,29). CR typically takes place soon after discharge from hospital. Moreover, core components of CR, such as physical exercise and psychoeducational programs, target key illness cognitions and erroneous beliefs, suggesting that changes in illness perceptions and outcomes are likely.

Thus, the aims of the present study are to investigate whether illness perceptions change after participation in a comprehensive CR program and, if so, whether these changes are paralleled by changes in health-related quality of life (HRQOL).

Method

Participants

Participants were recruited in between May 2007 and September 2009 from a major cardiac rehabilitation centre in the Netherlands. All Dutch-speaking patients under 75 who had been diagnosed with ischemic coronary heart disease were eligible for participation. Of 316 eligible patients, 158 signed a letter of informed consent and completed measures upon admission to (T0) and completion of cardiac rehabilitation (T1). This represents a response rate of 50%. General sample characteristics are displayed in Table 1. Approval from the relevant Medical Ethics Committee was obtained for the study.

Measures

Clinical data, including disease severity, admitting diagnosis, cardiac history, co-morbidity, and cardiac risk factor profile, were obtained from admission medical records (T0). The New York Heart Association (NYHA) functional capacity was used to index disease severity. Demographic data included age, gender, marital status and education, and were obtained from a self-report questionnaire administered upon entry to cardiac rehabilitation (T0).

Illness perceptions were measured upon entry to (T0) and completion of (T1) cardiac rehabilitation using the Dutch version of the Brief Illness Perception Questionnaire (30, 31). The (single-item) dimensions consequences, timeline, identity, personal control, treatment control and coherence, and the (two-item) dimension emotional representation were administered. Responses were scored on a 10-point Likert-type scale, with higher scores reflecting a greater endorsement of the given belief (e.g., higher scores indicate a longer timeline, more consequences, greater control etc.).

Health-related Quality of Life (HRQOL) was measured at T0 and T1 using the Dutch validated version of the MacNew Heart Disease Health-related Quality of Life Questionnaire (32,33) which has been shown to have good discriminative and evaluative properties (34). This 27-item disease-specific questionnaire assesses the impact of the cardiac condition on several aspects of the patient's life over the last four weeks. Items are scored on a 7-point scale ranging from 1 (poor HRQOL) to 7 (high HRQOL), with a physical function subscale, an emotional function subscale, and a social function subscale, and a total HRQOL scale.

Procedure

Upon admission to (T0) and completion of (T1) CR, patients filled out a self-report questionnaire as part of the routine intake procedure. In accordance with the Dutch Guidelines for Cardiac Rehabilitation (35) the three-month outpatient CR program comprised (a) physical training sessions three times a week, consisting of cycling and weight training at a level of intensity of 70% of initial maximal oxygen consumption (VO^2 max) (supervised by a physical therapist) ; (b) 4 two-hour psychoeducational sessions on the pathophysiology of heart disease (led by a physician), healthy eating (led by a dietician), exercise (led by a physical therapist), and psychological adjustment (led by a social worker); (c) a two-hour practical session on progressive relaxation (led by a physical therapist); and (d) if appropriate, consultations and sessions on weight reduction, quitting smoking, and stress reduction and/or stress management (led by psychologists, dieticians, and social workers).

Data analysis

Based on a previous study examining changes in HRQOL outcomes after CR in the Netherlands (34), small to modest effect sizes can be expected. A priori analyses carried out in G*Power (36) showed that a sample of 95 patients would be sufficient to detect an effect size of at least 0.2 with 80% power at the 5% significance level. Data were analyzed using SPSS for Windows version 17.0. Prior to analyses, data were screened for missing values and violations of the assumptions for ANOVA and multiple regression, including the assumption of normality and multicollinearity. The physical, social, and emotional HRQOL scores violated the assumption of normality and showed moderate to severe negative skewness. Inverse square root transformations normalized the quality of life scores. At both measurement points (T0 and T1) some information was missing due to incomplete self-report questionnaires. Missing data were less than 10% for the HRQOL scores at T0 and less than 5% for the scores at T1. No missing data techniques, such as multiple imputation, were applied.

Pearson correlations and t-tests were carried out to examine potential confounding variables. Disease severity (NYHA functional status), but not age and gender, was found to be significantly related to HRQOL scores. In order to test the stability of illness perceptions over time, one-way repeated measures ANOVAs were computed across time points. Subsequently, hierarchical multiple regression analyses controlling for disease severity and illness perceptions at entry to CR (T0) were carried out in order to examine whether illness perceptions at completion of

CR (T1) predicted HRQOL at T1. Even though the bivariate correlations between the individual T0 and T1 illness perceptions did not exceed 0.7, the VIF-values and the tolerance statistics indicated slight multicollinearity between the illness perceptions predictors. For this reason a principal component analysis was carried out to determine the factor structure of the IPQ Brief. As presented below, a two-factor solution with, on the one hand, a control-related dimension and, on the other hand, an impact-related dimension was found. Subsequently, the hierarchical multiple regression analyses were repeated with the two illness perceptions dimensions in order to examine whether the T1 Impact and Control dimensions predicted HRQOL at T1 after controlling for disease severity and the T0 Impact and Control dimensions.

Results

Factor Analysis

Several studies have pointed out the negative relationships between the illness coherence/control-related dimensions and the other illness perceptions, as well as the positive interrelationships between timeline, identity, consequences, and the emotional representation dimensions (1,11). A principal component analysis with a two-factor solution confirmed this pattern in our data (factor loadings are presented in parentheses); timeline (.56), identity (.73), consequences (.87), and the emotional representation items ‘concern’ (.85) and ‘response’ (.82) loaded on one factor, which was interpreted as reflecting ‘Impact’ of the illness. The control-related dimensions personal control (.72), treatment control (.56), and illness coherence (.72) loaded on a second factor, which was considered to represent illness ‘Control’. The total amount of variance explained by the two factors was 55.6%.

Stability of illness perceptions

One-way repeated measures ANOVAs showed that all illness perceptions other than timeline and personal control changed significantly from entry to CR to completion of CR. As is shown in Table 2, patients perceived fewer consequences ($F(1,154) = 36.56$, $p < 0.001$) and fewer symptoms of their cardiac disease (identity: $F(1,152) = 25.86$, $p < 0.001$) over time. The emotional impact of the disease decreased (emotional representation: $F(1,155) = 38.08$, $p < 0.001$) and patients' sense of understanding of the disease increased (coherence: $F(1,153) = 7.91$, $p < 0.01$) Finally, perceptions about the extent to which the treatment could help control their disease also increased significantly (treatment control: $F(1,149) = 5.68$, $p = < 0.05$). In contrast, perceptions of the duration of cardiac disease remained stable over the course of CR. Perceptions about personal control increased slightly, albeit non-significantly. Finally, the overarching 'Impact' and 'Control' dimensions also showed a significant change over time; perceptions of impact decreased ($F(1,155) = 38.08$, $p < 0.001$ and perceptions of control increased $F(1,153) = 11.41$, $p < 0.01$).

Changes in illness perceptions and quality of life

Table 3, displaying the results of the hierarchical multiple regression analyses, shows that illness perceptions at T1 explained a significant amount of variance in emotional, physical, social and total HRQOL-scores ($p < .01$), after controlling for baseline HRQOL scores and disease severity. In particular, illness coherence (the extent to which the patient understands the illness), illness identity (the symptoms associated with the illness) and emotional representation (to what extent the patient is emotionally affected by the illness) were found to be related to HRQOL. The standardized coefficients show that fewer symptoms and a smaller perceived emotional impact of the illness was related to enhanced HRQOL at the end of CR ($p < 0.01$). Furthermore, the better patients' sense of understanding the illness, the higher social, physical and total HRQOL-scores were ($p < 0.05$).

As the VIF-values and the tolerance statistics indicated slight multicollinearity between the illness perceptions predictors, the analyses were repeated using the two overarching ‘Impact’ and ‘Control’ dimensions. Table 4 shows that the illness perceptions dimensions explained a significant amount of the variance in emotional, physical, social and total HRQOL ($p < .01$), after controlling for baseline HRQOL scores and disease severity. The standardized coefficients show that low perceptions of impact at the end of CR were related to better HRQOL ($p < .01$), Perceptions of control, however, did not significantly predict HRQOL ($p > .05$).

Discussion

We found that illness perceptions of cardiac patients changed during CR and that these changes were related to changes in HRQOL. Overall, perceptions related to impact of the disease decreased, whereas perceptions of control increased. Patients perceived fewer consequences of their disease, attributed fewer symptoms to their illness, experienced an increased sense of illness coherence, a greater sense of treatment control, and a lessened emotional impact of the disease. Thus, patients came to view their illness as more benign over the course of CR. This is in contrast to earlier studies on cardiac patients, which found that patients came to view their illness as more chronic (i.e., longer timeline) and less controllable (26,27). These patients, however, did not attend CR. CR typically takes place during the more acute phase of coronary heart disease, in which illness perceptions are still being updated as a results of changes in treatment and disease status. For obvious lack of a control condition, it is not possible to draw any conclusions as to whether the reported changes in illness perceptions in our sample were brought about by participation in CR, or whether they are a non-specific effect of adaptation to illness. Nonetheless, our results suggest that during CR illness perceptions are still susceptible to change, thus providing a window of opportunity during which negative illness perceptions that are not in accordance with disease severity can be altered and positive perceptions can be strengthened. Moreover, such interventions may be fitted in the existing infrastructure of CR relatively cost-effectively; a recent systematic review shows that different health practitioners can be trained to adequately deliver interventions aimed at changing maladaptive illness beliefs (37). Other support comes from the field of reattribution theory, which has longstanding experience in training health professionals other than psychologists in rectifying maladaptive illness beliefs (38,39). Future research should investigate whether CR can be used as a vehicle to affect changes in illness perceptions in a direction that is compatible with recovery.

The second aim of the study was to investigate whether the reported changes in illness perceptions were related to quality of life in cardiac patients. Overall, patients perceived a lessened impact of their disease after CR and this was associated with enhanced emotional, social, physical and total HRQOL. In particular, perceiving fewer emotional consequences of the illness, gaining a better understanding, and attributing fewer symptoms to the illness at the end of CR, was related to better HRQOL. Perceptions of control did not appear to be related to wellbeing. Previous studies in cardiac patients have also found optimistic impact-related illness perceptions to be predictive of wellbeing (40) and pessimistic impact-related perceptions to predict distress (41). This is in line with self-regulation theory, which suggests that quality of life is likely to be enhanced when reminders of the disease (i.e., attributed symptoms and associated worry) are moderated and patients come to view the disease as less threatening (9). Our finding that control-related perceptions were not associated with HRQOL has been reported before by French and colleagues (13).

Limitations

We used Kaptein and colleagues’ adaptation of the IPQ Brief. This Dutch version has been shown to have relatively good reliability and moderate validity (31). Yet, concern has been raised with regards to the phrasing of items and the wording of the control-related items in Dutch (42, 43). In view of this recent debate about the psychometrical qualities of the IPQ Brief and, in particular, the validity of the Dutch version (42-44), future research may prefer to use the IPQ-Revised, which shows good reliability and validity (45). Furthermore, as this version of the IPQ is more commonly used in cardiac research (e.g., 27-29), this would allow for better comparison between samples on a subscale level.

In conclusion, we found that illness perceptions of cardiac patients changed over the course of CR and these changes were associated with enhanced HRQOL. Clinical trials have shown illness perceptions in cardiac patients to be modifiable during the acute phase of the disease (28,29). Evidently, CR provides a very suitable setting in which the evolution of illness perceptions over time can be monitored and maladaptive beliefs can be modified.

Table 1.
Sample characteristics.

	Patients (N=158)
Gender	
Men	127 (80.4)
Women	31 (19.6)
Age	58.0 ± 9.2
Marital status	
Single	11 (7.0)
Married/partnered	131 (82.9)
Divorced/separated	10 (6.3)
Widowed	5 (3.2)
Education	
Primary education	8 (5.1)
Secondary education	9 (5.7)
Vocational education	97 (61.4)
Tertiary education (college/university)	44 (27.2)
Type of work	
Full-time	82 (51.9)
Part-time	27 (17.1)
Home/retired	48 (30.4)
Diagnosis	
Myocardial Infarction	60 (38.0)
Coronary Artery Bypass Surgery (CABG)	45 (28.4)
Percutaneus Coronary Intervention (PCI)	41 (25.9)
Arrhythmias	9 (5.7)
Other †	3 (1.9)
Cardiac History §	
Yes	53 (33.8)
No	104 (66.2)
NYHA	
I	90 (57.6)
II	48 (30.9)
III	17 (10.9)
IV	1 (0.6)

Note: Values are shown as n(%) or mean ± SD where appropriate.
† Prosthetic valve or valve repair surgery (n=2), angina pectoris (n=1)
§ Includes antecedent cardiac events such as myocardial infarction, CABG, PCI or arrhythmias

Table 2.
Descriptive statistics and change in illness perceptions at entry to CR (T0) and completion of CR (T1).

	T0	T1	df	F	p
Illness Perceptions					
Consequences	5.44 ± 2.62	4.27 ± 2.68	1,154	36.56	0.00
Timeline	6.95 ± 3.32	7.11 ± 3.59	1,150	0.52	0.47
Control (self)	6.06 ± 2.38	6.40 ± 1.86	1,148	1.84	0.18
Control (treatment)	7.71 ± 1.86	8.14 ± 1.56	1,149	5.68	0.02
Identity	4.12 ± 2.57	3.10 ± 2.37	1,152	25.86	0.00
Coherence	6.61 ± 2.82	7.31± 2.44	1,153	7.91	0.01
Emotional Representation	4.56 ± 2.53	3.47 ± 2.52	1,155	38.08	0.00
Impact dimension	5.10 ± 2.20	4.26 ± 2.19	1,155	39.55	0.00
Control dimension	6.78 ± 1.64	7.28 ± 1.45	1,153	11.41	0.00
HRQOL					
Emo HRQOL	5.34 ± 1.16	4.89 ± 0.56			
Social HRQOL	5.61 ± 1.05	5.63 ± 0.89			
Physical HRQOL	5.19 ± 1.03	5.90 ± 0.84			
Total HRQOL	5.37 ± 0.96	5.36 ± 0.63			

Note: Data are presented as mean ± SD

Table 3

Hierarchical Multiple Regression Results: explained variance (R^2), standardized coefficients (βs), and total model adjusted R^2 with HRQOL regressed on illness perceptions at T1.

Variable	Total Quality of Life (T1)	Emotional Quality of Life (T1)	Physical Quality of Life (T1)	Social Quality of Life (T1)
Block 1: Control Variables				
T0 measure per outcome variable	.41**	.32**	.26**	.46**
Disease severity †	-.02	.09	-.09	-.09
R^2	28.8%**	17.2%**	25.4%**	38.4%**
Block 2: Illness Perceptions T0				
Consequences	.05	.14	-.06	.12
Timeline	-.09	-.05	-.10	-.15
Control (self)	-.01	.01	-.01	.02
Control (treatment)	.16*	.15	.15*	.11
Identity	.07	.15	-.01	.07
Coherence	-.15*	-.08	-.12	-.14*
Emotional Consequences	.08	-.13	.16	-.01
R^2	34.4%	24.4%	33.4%*	44.4%**
Block 3: Illness Perceptions T1				
Consequences	.06	.06	.04	.04
Timeline	.12	.06	.13	.12
Control (self)	-.06	-.07	-.01	-.10
Control (treatment)	-.05	-.07	-.04	.03
Identity	-.43**	-.21	-.49**	-.36**
Coherence	.16*	.12	.13*	.13*
Emotional Consequences	-.30**	-.36**	-.25*	-.27**
	59.8%**	39.2%**	60.3**	63.7**
Total Adjusted R^2	54.5%	31.4%	55.0%	58.8%
Total Model F(df)	11.18(16, 136)**	5.07(16, 142)**	11.40(16, 136)**	13.15(16, 136)**

*Note: * p < .05; **p < .01 †NYHA Functional Status*

Table 4.
Hierarchical Multiple Regression Results: explained variance (R^2), standardized coefficients (βs), and total model adjusted R^2 with HRQOL regressed on Impact and Control dimensions at T1.

Variable	Total Quality of Life (T1)	Emotional Quality of Life (T1)	Physical Quality of Life (T1)	Social Quality of Life (T1)
Block 1: Control Variables				
T0 measure per outcome variable	.38**	.36**	.25**	.44**
Disease severity †	- .07	.10	-.15*	-.12
R^2	28.8%**	17.2%**	25.4%**	38.4%**
Block 2: Illness Perceptions T0				
Impact dimension	.15	.12	.10	.09
Control dimension	- .01	.05	.01	-.03
R^2	31.1%	19.2%	29.5%*	41.3%*
Block 3: Illness Perceptions T1				
Impact dimension	-.48**	-.41**	-.50**	-.43**
Control dimension	.05	.01	.07	.05
R^2	43.5%**	27.8%**	43.1%**	51.4%**
Total Adjusted R^2	41.0%	24.6%	40.5%	49.2%
Total Model F(df)	16.97(6, 138)**	8.84(6, 144)**	16.66(6, 138)**	23.24(6, 138)**

*Note: * $p < .05$; ** $p < .01$ †NYHA Functional Status*

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