Early e-Health cardiac rehabilitation: The role of anxiety and depression in adherence to exercises in patients who underwent an open-heart surgery.

Bachelor Thesis

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Abstract

Background: Cardiovascular disease (CVD) is the most common cause of death globally, in particular coronary events such as heart attacks and strokes. In CVD patients, coronary artery bypass graft (CABG) or valve surgery are common open-heart operations. After an operation, cardiac rehabilitation is important for recovery, but adherence to these programs is poor.
Objective: To evaluate the role of anxiety and depression in adherence to exercises in an early cardiac e-Health program in patients with CVD, who underwent an open-heart operation.
Method: An exercise-based early cardiac e-Health rehabilitation program was designed. It was chosen for an e-Health program (website), because it was easy accessible and tailored to the individual needs, what makes it advantageous to centre-based rehabilitation. A total of 35 patients (29% women) with cardiovascular disease who recently underwent an open-heart surgery and took part in the intervention group of a controlled clinical trial, that evaluated the early online program, were included in the analysis.
A multiple linear regression analyse was conducted to evaluate the relation of age, anxiety and depression with adherence to exercises. Therefore baseline scores of the hospital anxiety and depression scale (HADS) were compared to total adherence scores. Adherence to the recommended frequency of exercises was measured by log-data and a total score (percentage completed exercises of the prescribed exercises) for each patient was calculated.
Results: With 63%, the mean adherence to exercises was relatively good compared to other studies. The regression analyse showed no significant relation of anxiety and depression with adherence ($p = .681$). In addition, the results of the multiple regression analyse showed that age significantly predicted adherence, as older patients showed better adherence to the exercises than younger patients did ($R^2 = .126$, $p = .04$).
Conclusion: This study showed that anxiety and depression did not predict adherence to the evaluated e-Health program. An association was found between age and adherence. Although adherence to this program was relatively good, there are still 34% of patients who did not use the program as intended. Adherence can be improved by persuasive technology design principles, that are elaborated in this study. A follow-up study with the revised version of the program should evaluate if adherence to the exercises improves with the program modifications, aiming to design a successful cardiac rehabilitation intervention.

Introduction

On a global scale, cardiovascular disease (CVD) is a major killer, in particular acute coronary events such as heart attacks and strokes. Although recurrence of these events can be significantly reduced by cardiac rehabilitation programs (CRP), adherence to these programs is poor. There is now increasing interest in electronic health (e-Health) rehabilitation programs and factors that increase adherence to these programs. Adherence in patients is not only attending a program, but the degree in which a patient follows an e-Health program as intended by the designer (Sieverink, Kelders, & van Gemert-Pijnen, 2017). This research aims to investigate the role of anxiety and depression in adherence to exercises in an online CRP. Participants recruited for this study are patients with CVD who underwent an open-heart surgery.

Every year approximately 17 million people worldwide die of the consequences of cardiovascular disease. Across the European region, it causes more than half of all premature deaths (World Health Organisation, 2018). Usually CVD patients fall ill years before they recognize the first symptoms, which is generally in the time of middle age (35-65 years old). CVD develops over many years and its underlying pathology is atherosclerosis (World Health Organisation, 2007). Within CVD patients, coronary artery bypass graft (CABG) or valve surgery are common open-heart operations, to improve blood supply to the heart muscle. Since 1970 CABG is the most durable and complete treatment for diminished blood circulation (Kulik et al., 2015). This surgery reduces mortality, improves the quality of life and gives relief to chest pain (Alexander et al., 2005). However, months and years after the surgery, patients are at a high risk for recurring coronary events, due to the progression of native coronary artery disease or the development of vein graft atherosclerosis (Kulik et al., 2015). Therefore, secondary prevention is of importance, to reduce risk factors in people with established CVD and patients who underwent CABG or valve surgery.

Widely recognized primary risk factors are smoking, cholesterol level and systolic blood pressure (Taylor et al., 2004). Psychosocial aspects such as low socioeconomic status, acute and chronic life stressors, lack of social support, anger and hostility and anxiety and depression increase the risk of future cardiac events in patients (Pogosova et al., 2015). Obesity and physical activity are also predictors of recurring clinical events, but their unique contribution is disputable, because they are to a large extend correlated to the major risk factors (World Health Organisation, 2007).

Standard cardiac rehabilitation (centre-based)

Cardiac rehabilitation programs are gaining more importance, because our population ages and so the time to live with a chronic disease is increasing and more and more people will get CVD in the coming years. These programs are usually centre-based and aim to reduce mortality and risk factors in cardiac patients, to enhance and maintain cardiovascular health and avoid recurrence of cardiac events. Individualized programs are designed to optimize physical, social, vocational and emotional status of current patients (Canadian Association of Cardiac Rehabilitation, 1998). The programs include a change into a healthy lifestyle and reduction of health endangering behaviour. Achieving a change of lifestyle can be considered as especially difficult within the target group of CVD patients. The disease often develops due to a sedentary lifestyle and low physical fitness (Torpy, Burke, & Glass, 2009). So, CRPs demand a change into a more active lifestyle, from a group of patients who on average have a low physical fitness and are used to an inactive life. Also, CVD patients are of older age what make them less flexible and changeable to a new lifestyle. Moreover, standard cardiac rehabilitation involves medical recommendations, health education, supervised physical exercises and dietary change (Jackson, Leclerc, Erskine, & Linden, 2005).

Evidence is found that CRPs, as a secondary prevention, have beneficial effects on patients' health status. Those programs reduce cardiovascular mortality by 20-25% (Jackson et al., 2005). They also reduce risk factors and incidents of adverse cardiac events in patients with established CVD (Anderson et al., 2016). Moreover, cardiac rehabilitation (CR) improves patients' recovery and physical fitness (Dusseldorp, van Elderen, Maes, Meulman, & Kraaij, 1999). Furthermore, CR that is exercise-based was found to have beneficial effects on anxiety, depression and feelings of isolation (Lavie, & Milani, 2004; Rutledge, Redwine, Linke, & Mills, 2013). It results in the ability to carry out daily tasks and increase the patient's quality of life (Dafoe, Arthur, Stokes, Morrin, & Beaton, 2006). Improvement in psychosocial health is only found in exercise based CR, therefore the integration of exercises in CRPs appears to be a successful form of rehabilitation in CVD patients (Pogosova et al., 2015).

Due to the high mortality rate of more than 4 million deaths in Europe and approximately 2 million deaths in the European Union caused by cardiovascular disease, the European Society of Cardiology (ESC) stresses the importance of cardiac rehabilitation (Scharf, cited in Frederix et al., 2015). Usually the standard CR starts 6 weeks after the patient is discharged from the hospital, although there is a demand for CR also in the first weeks after discharge (Dafoe et al., 2006).

Early centre-based cardiac rehabilitation

Patients with CVD are limited in their physical exercise capacity during the first weeks after discharge from the hospital, but there are small exercises physicians recommend to perform. Also, patients feel unconfident about their possibilities and wish to be professionally supervised in the first weeks (Dafoe et al., 2006). An early start with cardiac rehabilitation (4-14 days of hospital discharge) results in significant effects on the confidence of patients, a positive attitude towards CRP, increase in participation, recurrence of coronary events and a successful recovery after an open-heart operation (Parker et al., 2011; Dafoe et al., 2006). It is widely assumed that the overall uptake of early CR is higher compared to CR that starts 6 weeks after patients are discharged from the hospital (Parker et al., 2011). Not all patients are eligible for early CR, depending on their clinical stability. Within eligible patients, no evidence is found for increased health risks due to early CR (Dafoe et al., 2006).

Main predictors of adherence to centre-based CRPs in patients are: Sex differences (adherence higher in men), physician endorsement, self-motivation and self-efficacy, social support, therapy-trust, higher education and marital status (higher in married patients) (Jackson et al., 2005; Cooper et al., 2002; King et al., 2001; Rowe, & Calnan, 2006; Graham, Shahani, Grimes, Hartman, & Giordano, 2015; Capomolla et al., 2002).
Barriers for the uptake of centre-based CRPs are travel difficulties, inconvenient scheduling, social commitments, lack of perceived need, functional impairment and a one-fits-all care approach (Clark et al., 2015). Some of these barriers can be improved in e-Health interventions.

E-Health cardiac rehabilitation programs

The challenges of traditional CR have led to the development of alternative programs, which are more individualized, flexible and technology based. E-Health interventions make use of technology in different ways (e.g. devices, internet programs, communication technology, etc.). Many health practitioners use Internet platforms to upload videos about home exercises and communicate with patients about their progress and health status (Huang et al., 2015). E-Health interventions have numerous advantages: First, it makes healthcare easily accessible, because patients can use e-Health interventions at home. Second, it is flexible, because patients can decide at what moment they wish to use the program and they do not have to adapt to a fixed time-schedule. Third, e-Health assists the physiotherapist and is timesaving, because it is an unlimited resource and can be used by many patients at the same

time (Frederix et al., 2015). Fourth, it is easily possible to tailor the program to needs, risk factor profile and preferences of the patient and thereby it is more suitable and effective than standard centre-based CR (Clark et al., 2015).

Tailored e-Health interventions are interesting for patient groups with special needs. Within cardiovascular disease, patients who underwent an open-heart surgery (CABG or valve surgery) are extremely limited in their physical abilities and can be identified as subgroup with special needs. They require care, tailored to their limitations and individual speed of progress. After the surgery, it takes weeks until there is sufficient healing of sternotomy and surgical incisions, but low-level exercises (eg. walking) with slow progression can already be performed 48 hours after the surgery (Dafoe et al., 2006).

Individualized e-Health interventions are found to be effective in improving exercise capacity and risk factors of CVD in patients (Widmer et al., 2015). However, recent literature reviews found the effectiveness to be similar compared to centre-based CRP and other delivery models (Hwang, Bruning, Morris, Mandrusiak, & Russell, 2015; Huang et al., 2015). No evidence is found that CRPs have additional value compared to standard CRPs regarding the health outcome of CVD patients. A lack of many studies was that no information about rehospitalisation and repeated cardiac events was included. In addition at risk groups, including women, elderly, culturally and linguistically diverse populations were under represented in many trials (Clark et al., 2015). The idea behind e-Health is not to replace standard health care, but to support it. It seems to be an alternative for patients who cannot access traditional centre-based CRP or who require personalized care due to their special needs.

Adherence to e-Health cardiac rehabilitation programs

E-Health CRPs appear to have slightly higher adherence rates compared to centre-based CRPs (Frederix et al., 2015; Hwang, et al., 2015). Reasons for better adherence are the accessibility, flexibility, tailoring and the empowerment of the patient by self-management. Although adherence rates are relatively better compared to centre based programs, rates are still low and improvement is needed.

In our study, physical exercises were the main component of the online CRP. Patients who are referred to as non-adherent, do not follow the exercises to the degree as prescribed by the physician. Log data has potential to evaluate usage behaviour of patients (Sieverink, Kelders, & van Gemert-Pijnen, 2017). It is possible to monitor which exercises are completed and at what moment. However, measuring adherence to e-Health interventions is difficult, since log-

data only gives information about the amount of usage. Large exposure to the program does not mean that it is beneficial to the health outcome of the patient. E-health strives for adherence in terms of efficacy of usage and not amount of usage (Sieverink, Kelders, & van Gemert-Pijnen, 2017). Therefore log-data needs to be monitored in comparison with the intended use (prescribed exercises).

Non-adherence has a negative effect on treatment outcomes, can worsen the status of illness, false diagnoses and frustration in both patients and physician (Cooper, Jackson, Weinsman, & Horne, 2002). Also, it contributes to a high risk of adverse cardiac events and non-adherent patients are at greater risk of cardiac death within the first month after Myocardial infarction (Gehi, Haas, Pipkin, & Whooley, 2005; Ziegelstein et al., 2000).

Barriers influencing if the patient uses e-Health innovation as prescribed have been identified: First, higher drop-out rates were found in studies with more telephone contact, compared to other e-Health models of CR. Second, long-lasting interventions (6 months) are a burden, compared to brief ones (3 month) (Clark et al., 2015). Third, adherence in e-Health programs without a self-management component was inferior to programs with a big self-management component. Fourth, technophobia (non-acceptance of technology) in patients seems to be a barrier, which can be reduced by tailoring the technology system to the user (Cruz, Brooks, & Marques, 2014).

Anxiety and depression: The risk of a poor treatment uptake is 3 times higher in depressed patients compared to non-depressed patients (DiMatteo, Lepper, & Croghan, 2000). Depressed people have impaired cognitive focus, energy, motivation, lack of social support, negative beliefs about the treatment and feelings of hopelessness, what makes it difficult for them to follow through with exercise-based cardiac rehabilitation (Gehi et al., 2005; DiMatteo et al., 2000).

Evidence is found that anxiety predicts non-adherence to exercise programs and not changing into a healthier lifestyle (Kuhl, Fauerbach, Bush, & Ziegelstein, 2009). Furthermore, not following CRPs as recommended by the physician can be a coping strategy of anxious people. Patients reported to feel less distress when they avoid and deny being reminded of their illness, by disease related programs (Farley, Wade, & Birchmore, 2003).

With regard to e-Health interventions, early cardiac rehabilitation programs appear to decrease risk factors and reduce depression and anxiety. In patients with CVD, symptoms of anxiety and depression are common (30 %) and are strong predictors of non-adherence to CRP (Farley, et al., 2003). Therefore patients with high depression and anxiety can be

identified as a risk group and need special attention, while discovering obstacles that lead to non-adherence in CHD patients.

The above-described literature shows a variety of factors influencing adherence to cardiac rehabilitation. To our current understanding, just a few studies with small sample sizes have examined adherence to exercises in e-Health cardiac rehabilitation, specifically at an early stage. Due to the great potential of early e-Health programs in cardiac rehabilitation, more research on that topic is important and investigated in our study. Medisch Spectrum Twente (MST) developed a patient tailored early CRP, based on physical exercises to provide a continuous treatment for patients who underwent an open-heart surgery. Our study focuses on factors associated with adherence to exercises in that program.

This leads to the research question: Are anxiety and depression predictors of low adherence to exercises in an early online cardiac rehabilitation program, in patients with cardiovascular disease who recently underwent an open-heart surgery?

Methods

Study design and participants

For our study, a dataset from a research of the hospital in Enschede "Medisch Spectrum Twente" (MST) about early cardiac e-Health rehabilitation is used. A quasi-experimental study was conducted, including patients diagnosed with cardiovascular disease, who underwent CABG or valve surgery in the MST hospital. Participants were selected by convenience sampling; there was no process of randomisation. The researchers asked all relevant patients, to participate in the study. The patients had to meet the following inclusion criteria to be eligible:

- CABG or salve surgery
- Clinically stable and capable of exercising (judgement of cardiologist)
- Intended to participate in the regular centre-based program
- Internet access
- Master of Dutch language (reading and writing)
- Living in proximity area of MST
- Age >18

There are no exclusion criteria defined. The first 42 patients who agreed to participate were distributed to the control group; the following 46 patients were assigned to the intervention group. The distribution of participants and drop-outs during the data collection period are visualised in figure 1.

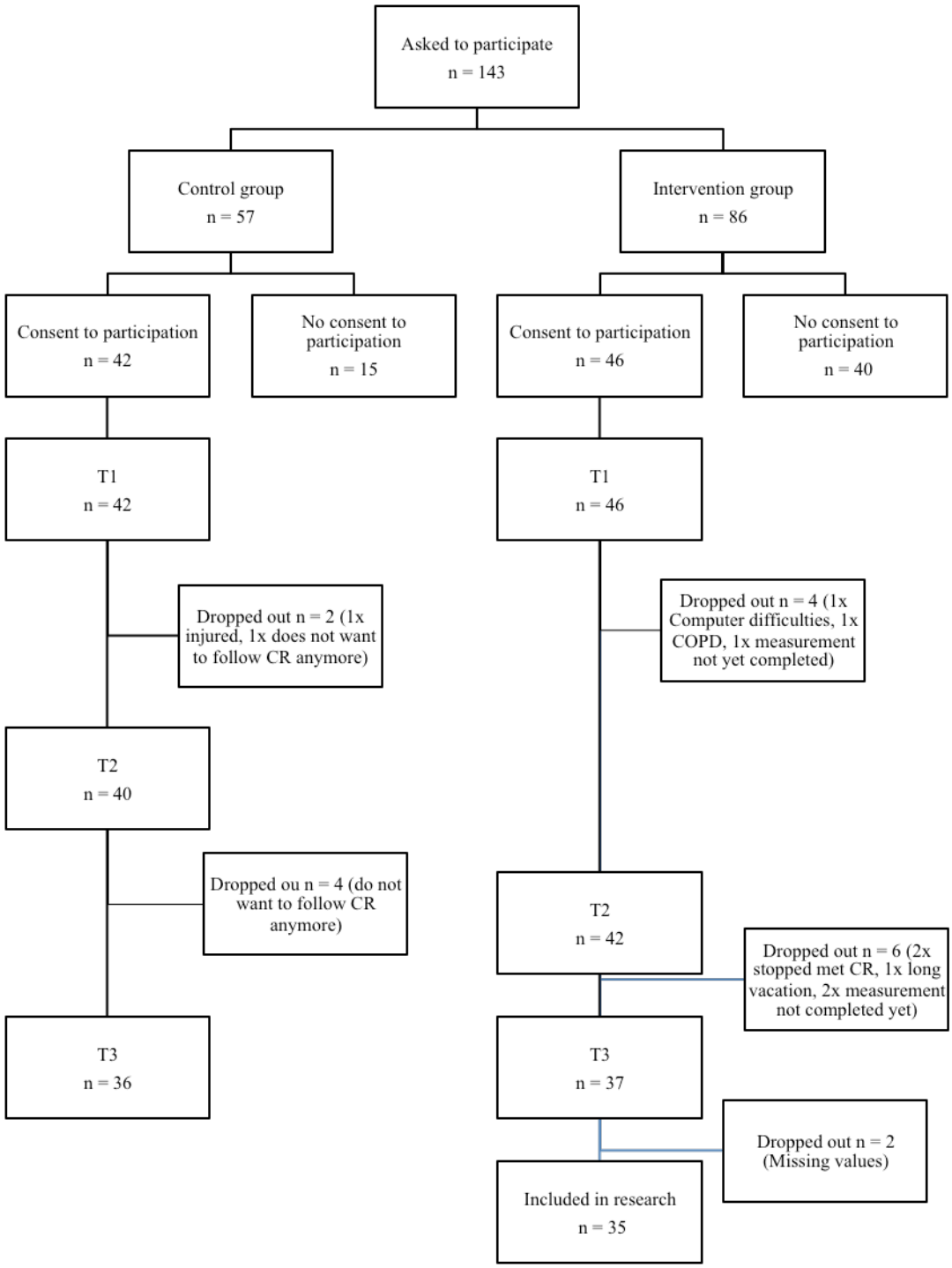

Figure 1.

Flow chart control group and intervention group

Patients in the intervention group completed a home-based early CR treatment, in form of an online exercise program. The program started in the first days after discharge from the hospital and it took 6 weeks to complete the program. The control group did not receive a treatment, but got the regular health recommendations of their physiotherapist. In order to specifically analyse factors that influence adherence to the program, we selected the subgroup of patients who participated in the intervention condition. The demographic characteristics of the 35 patients examined are outlined in table 1. The mean age was 65.66 years. The youngest patient was 46 and the oldest 80 years old. Most of the patients were men. The majority was married, retired and had a coronary artery bypass graft. The distribution of high educated and low educated participants was balanced.

All participants signed an informed consent before the start of the study. Patients could decide to leave the study at any moment for any reason, without consequences. The investigator could withdraw subjects from the study for urgent medical reasons. Withdrawed subjects were not replaced.

Table 1

Baseline characteristics of the intervention group (n=35)

	n	%
Sex		
- Male	25	71
- Female	10	29
Diagnosis		
-CABG	23	66
- AVR	6	17
- CABG/AVR	3	9
- Combination above	3	9
Marital status		
- Married	27	77
- Unmarried	7	20
- Missing	1	3
Highest education		
- High educated (MBO and higher)	17	49
- Low educated (middelbare school and lower)	17	49
- Missing value	1	3
Work status		
- Employed	11	31
- Unemployed	6	17
- Retired	17	49
- Missing value	1	3

Note. Totals of percentage may not be 100 for every variable due to rounding. CABG: Coronary artery bypass graft. AVR: Aortic valve replacement.

Intervention

MST developed an exercise-based online early cardiac rehabilitation program, aiming to support patients in their rehabilitation process at home. Basis of this program was an existing home-based exercise program, for other diagnosis groups (chronic pain, COPD, oncology, etc.). This program was adapted to the requirements of cardiac rehabilitation, evaluated by focus groups with patients and physiotherapists. The program consists of a database with 60 different exercise videos, recorded by the physiotherapist, including written and spoken descriptions. There are five different exercise categories: strengths (arms/shoulders, legs, butt), thoracal mobility, breathing, relaxation and balance. Patients are asked to perform 3 sessions a week, including 6 exercises per session. Exercises are adapted weekly by the physiotherapist, on the basis of the patient's health status and rehabilitation progress. The physiotherapist can chose from the catalogue of 5 different categories to tailor the program to the patient's profile (e.g. patients who score high on anxiety and depression have relaxation exercises included in their program, which are left out in others). The patient, as well as the physiotherapist get access to the online portal through a secure login, which also secures the patients data. On the professional's account, the therapist gets information on what exercises are performed and the moment of performance. Communication components are included where the patient can report difficulties under the exercise video, thereby the physiotherapist gains insight into the patient's rehabilitation progress and obstacles he/she faces. This is also evaluated by a questionnaire (e.g., Borg scale of perceived exertion), the patient has to fill in at fixed time intervals and allows modifying of the exercise program according to the patient's needs. Outcomes of the questionnaire are presented on the professional's portal, but also visible for the patient in order to view his/ her own progress. Additionally, the patient can indicate the perceived level of difficulty after each exercise and the therapist can adapt the level for the upcoming week. The interaction module facilitates contact between patient and professional, in form of text messages linked to exercises or general messages. The physiotherapist can decide if at all or at what time he wants to answer the questions.

Materials

The main study parameter was exercise capacity, examined with a 6 min-walktest. Secondary study parameters, measured with the help of different questionnaires, were anxiety and depression, health related quality of life, disability and satisfaction with the treatment. In addition, physical activity was measured objectively with an accelerometer and subjectively with a questionnaire. Other study parameters measured at baseline were sociodemographic variables (sex, age, education, marital status, occupation) and disease-related variables (diagnosis, co-morbidity, complications after surgery, medication, mobility).
For our analysis, the baseline measures (measured before the start of the program) of the anxiety and depression scale and log data (adherence) are used.

Adherence: Individual log data was collected of clicking, by patients on a green button after each exercise they have completed, to indicate if they have performed the exercise or not. This button was displayed under every exercise video in the online program, as illustrated in figure 2. Log-data gave information about the actual use of the program, showing the amount of exercises performed, which exercises were performed and at what moment. The intended use of the online program was that patients complete the exercises that were prescribed by the physiotherapist, in order to achieve the best health outcome (presuming that prescriptions of the physician have optimal effects on the patients' health outcomes). A total adherence score was calculated for each patient, showing the degree in which patients use the program as intended. This was the actual use (log-data) relative to the intended use (exercises prescribed). For example a patient who completed 80 exercises out of 100 gets a total adherence score of 80%. With the total scores, 3 equal groups of adherence were defined by the medical staff of the MST:

Group A (low adherence): <58%
Group B (medium adherence): 58-83%
Group C (high adherence): >83%

Figure 2.

Example of an exercise in the online program with the button system that measured log-data

The Hospital Anxiety and Depression Scale (HADS): A screening scale aiming to indicate possible states of anxiety and depression in the setting of a hospital medical outpatient clinic. The self-report scale consists of 14 items in form of statements (Appendix A). It contains two scales of 7 items, one for anxiety and one for depression. Both scales have a score range of 0-21 (Spinhoven et al., 1997). Respondents have to choose one out of 4 answers, which best indicates their emotional state as perceived during the last week (e.g. “I feel tense or 'wound up'“). The total score indicates the respondent’s normal (0-7), borderline abnormal (8-10) or abnormal (11-21) state of anxiety and depression. The homogeneity and test-retest reliability were good for the total scale and the subscales. Across different clinical settings and age

groups, the dimensional structure and reliability of the total scale was stable (Spinhoven et al., 1997). A high level for internal consistency is found for our study sample, regarding the anxiety sub-scale and the depression sub-scale. The Cronbach's Alpha for the anxiety subscale is 0.816 and for the depression subscale it is 0.812.
The construct validity is insufficient, because the scales for anxiety and depression were strongly correlated (Egberink & Vermeulen, 2018). The concurrent validity of HADS is good to very good, compared to other commonly used questionnaires and rating scales of anxiety and depression (Bjelland, Dahl, Haug, & Neckelmann, 2002).

Procedure

The first moment of data collection was one day before discharge from the hospital, to measure the baseline data of patients in the intervention and control group (sociodemographic variables, HADS, GARS, 6 min-walktest). The second measurement for both groups, was about 6 weeks after the first moment of data collection (after the completion of the online CRP), in the week before the traditional outpatient program starts (6 min walk test, GARS, HADS, IPAQ). The third data collection phase was about 12 weeks after the first moment, at this time patients have completed the outpatient program and it is the end of cardiac rehabilitation (6 min walk test, GARS, HADS, IPAQ, CSQ). Quality of life was measured two times, once in the second/third week after discharge from the hospital and once at the end of cardiac rehabilitation.

Clinical phase: At the moment of discharge from the hospital all patients got a questionnaire to investigate their subjective perception of their own activity level (IPAQ), to answer at home within the first week. Patients in the intervention group got instructions on how to use the online CR program at home.
Home phase (first 6 weeks after discharge): In the period after discharge from the hospital and before the traditional outpatient program starts, patients of the intervention group had access to the online program and were asked to follow the exercises as prescribed. Patients in the control group had no access to the online program and continued rehabilitation by themselves as advised by their physiotherapist.
Outpatient phase (week 7 until 12 after discharge): As part of standard care, both groups took part in a centre-based rehabilitation program. The outpatient program takes 6 weeks and the last measurements were taken in both groups after completion.

Analysis

At first, baseline data obtained in the intervention group of the HADS as well as total scores for adherence were controlled for missing data. Respondents, with missing data were deleted from the dataset. This includes data of drop-out patients, which were deleted from the sample and were not available for analysis. Due to this screening process, the answers of 11 respondents were excluded. The definitive dataset consisted of data from 35 participants. Thus, solely data of patients who completed the whole period (6 weeks) of the online program were included in the analysis.

The variables marital status, highest education and work status were categorised and recoded. Marital status was split into married and unmarried (single, divorced, living together with a partner, living together with children, other); highest education was categorised in high educated (MBO, Havo, Vwo, HBO, University) and low educated (none, primary school, basis occupational, secondary school); the variable work status was recoded into employed (fulltime, part-time), unemployed (disabled, not working) and retired.

Normality for total adherence scores, anxiety sum scores, depression sum scores and age was analysed by a P-P Plot of regression standardized residuals. Also homoscedasticity for these variables was checked by a scatterplot of the residuals. Significant outliers, high leverage points or highly influential points were assessed by a boxplot. Multicollinearity for the predicting variables (anxiety sum scores, depression sum scores and age) was estimated by looking at the VIF values of the multiple regression analysis.

In order to determine if there are any statistically significant differences on basis of total adherence scores (dependent variable) in relation to demographics (gender, age, education, work status, marital status), some independent-samples t-tests (gender, marital status, highest education), a correlational analysis (age) and a one-way ANOVA (work status) were conducted. In case we found significant differences (e.g. between women and men in relation to total adherence), those demographics would be possible confounders for the relation between total adherence scores and anxiety and depression scores. In consequence, possible confounders would be included as covariate in the regression analysis.

In a second step, a simple Pearson correlation analyse was conducted to analyse the association of anxiety and depression with adherence. Furthermore, a multiple linear regression analysis was run, in order to examine if anxiety sum scores, depression sum scores and possible confounders statistically significantly predict total adherence. In this analysis total adherence was the dependent variable and depression, anxiety and possible confounders were independent variables. This analysis was conducted hierarchically in 2 blocks, in order

to examine the unique explanation (R-squared) of anxiety and depression. The first block included possible confounders and the second block consisted of the anxiety and depression variables.

Lastly, two independent sample t-tests were run to look for differences in adherence between patients with normal or abnormal anxiety. The same analysis was run for normal and abnormal depression scores. It was decided to merge borderline abnormal and abnormal values and use the recoded variable for the analysis. The dependent variable was total adherence and the independent variable was anxiety (recoded) or depression (recoded).

Results

Patients' baseline anxiety and depression

The psychological characteristics (at baseline) and total adherence of the 35 patients included in this study are shown in table 2. Most of the patients had a normal score when it comes to anxiety and depression.

Table 2

Baseline anxiety and depression scores and total adherence scores of the intervention group (n = 35)

Variable	n	%	M	SD
Depression	34	97.1	4.4	4.0
- Normal (score: 0-7)	24	68.6	2.3	2.2
- Borderline abnormal (score: 8-10)	7	20	8.7	1.0
- Abnormal (score: 11-21)	3	8.6	12	1.0
- Missing	1	2.9	.	.
Anxiety	34	97.1	5.3	4.2
- Normal (score: 0-7)	21	60	2.5	2.2
- Borderline abnormal (score: 8-10)	8	22.9	8.4	0.7
- Abnormal (score: 11-21)	5	14.3	12.2	1.1
- Missing	1	2.9	.	.
Adherence	35	100	63.3	31
- Low (<58%)	12	34.3	27.4	23.5
- Medium (58-83%)	11	31.4	71.7	6.2
- High (>83)	12	34.3	91.4	6.5

Note. M = Mean. SD = Standard deviation. Totals of percentage may not be 100 for every variable due to rounding.

Adherence to the intervention program

Among the 35 participants included in the analysis, the three groups of adherence (low, medium, high) were approximately equal in size (table 2). The mean adherence to the exercises was 63.3% with a minimum of 0% and a maximum of 100%.

This study found no statistically significant differences in adherence for sex, highest education, marital status and work status (table 3). In other words, the variables gender, highest education, marital status and work status did not predict adherence and thus were not included in the regression analysis as covariates.

Analysis showed that age was statistically significantly correlated with total adherence ($r = .362$, $n = 35$, $p = .033$). The positive correlation between age and total adherence showed that the older the participant was, the better he/she adhered to the exercises in the intervention program. The variable age was found to be a potential confounding variable and was therefore included in the regression analysis as a covariate.

Table 3

One-way ANOVA and T-test results comparing demographic variables on adherence in the intervention group (n = 35)

Variable	n	M	SD	Test-value	p
Sex					
- Male	25	64.41	32.89	t(33) = .34	.733
- Female	10	60.36	27.05		
Education					
- Low	17	59.66	33.28	t(32) = -.58	.568
- High	17	65.92	29.95		
Marital status					
- Married	27	66.21	30.06	t(33) = -1.04	.667
- Unmarried	8	53.25	34.1		
Work status					
- Employed	11	61	25.25		
- Unemployed	6	44.82	38.44	F(31) = 1.54	.231
- Retired	17	70.28	31.34		

Note. M = Mean adherence score per category of demographic variables. SD = Standard deviation

Multiple linear regression analysis

The data for total adherence, anxiety sum scores, depression sum scores and age were normally distributed. Also, these variables meet the assumption of homoscedasticity. No significant outliers, high leverage points or highly influential points were found in the dataset. In addition, the data did not show multicollinearity for the predictor variable age in

correlation with anxiety and depression (VIF = 1.1). Also the variables anxiety (VIF = 1.9) and depression (VIF = 1.83) were not multicollinearistic.

Simple Pearson correlations of anxiety and depression with adherence showed no statistically significant correlation.

A multiple linear regression analyse was run to predict adherence based on anxiety, depression and age. The variable age statistically significantly predicted adherence (table 4). As age increases, so does total adherence. In addition, with every extra life year adherence increased with 1.1% (B = 1.14, SE_B = .53) (figure 3).

No significant regression equation was found for the variables anxiety and depression, when added to age as a predictor (table 4). The main findings showed that the variable age explained 13% of adherence to exercises in patients. The variables anxiety and depression added an extra 2% to the prediction of the behaviour, but this relation was not significant. So, neither anxiety nor depression seemed to have an association with adherence behaviour of patients.

Table 4

Multiple-linear regression results, showing the predicting value of age, anxiety and depression (independent variable) for total adherence (dependent variable) in the intervention group (n = 35)

	Variable	B	SE	Beta	p	R^2	ΔR^2	p
Model 1	Age	1.14	.53	.354	.04	.126	.126	.04
	Age	1.14	.57	.354	.054			
Model 2	Anxiety	.77	1.75	.103	.665	.148	.022	.681
	Depression	-1.54	1.78	-.197	.395			

Three linear regression analyses were run without including the variable age, in order to see the individual predicting value of anxiety and depression sum scores as well as total HADS scores. Also for these separate analyses, no statistically significant regression equations were found for anxiety, depression or total HADS scores (table 5).

Table 5

Results of 3 linear regression analyses, showing the predicting value of anxiety and depression sum scores as well as HADS total scores (independent variables) on total adherence (dependent variable) in the intervention group (n = 35)

Variable	B	SE	Beta	ΔR^2	p
Anxiety sum score	-.968	1.307	-.130	.017	.464
Depression sum score	-1.418	1.356	-.182	.033	.303
HADS total score	-.708	.726	-.170	.029	.337

With regard to possible differences in adherence between patients with normal or abnormal values for anxiety and depression, the independent t-tests showed no statistically significant differences in total adherence regarding anxiety t(32) = .361, p = .721 and also not for depression scores t(32) = .976, p = .337.

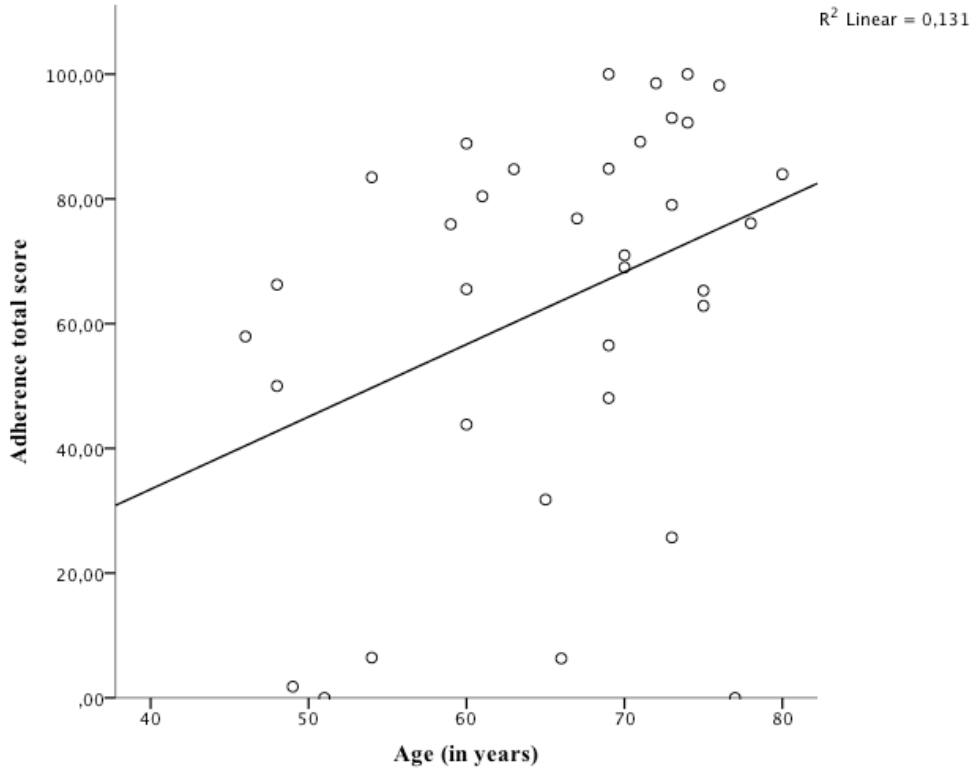

Figure 3.

Scatterplot showing the relationship between total adherence scores and age in 35 patients of the intervention group.

Discussion

The present study examined baseline data relating to demographics as well as anxiety and depression scores with regard to their ability to predict adherence to prescribed exercises in an early cardiac e-Health rehabilitation program. The mean adherence in our study was 63%. Symptoms of anxiety or depression in patients had no influence on their adherence to the exercises in the program. With regard to demographics, only age was found to be related to adherence behaviour. The older the patients were, the better they used the program as intended.

Adherence to the exercises in the e-Health program

In our study 41% of eligible patients attended the e-Health program, this attendance rate is similar to a comparable study of Rein et al. (2002) who found attendance to be 38%. In our sample the overall drop-out rate was 29%, including patients who did not complete the 6 weeks of the program or had missing values. The drop-out rate appears to be small compared to other studies (Rein et al. 2002; Farley et al., 2003).

Adherence to the exercises in the e-Health program was found to be 63% and is therewith better than in comparable studies. In earlier studies about centre-based cardiac rehabilitation adherence was found to be 25% to 31% in men and 11% to 20% in women (Jackson et al., 2005). Those large differences in adherence can be explained by differences in the cardiac rehabilitation program. It was found that adherence to standard centre-based cardiac rehabilitation is poor compared to home-based cardiac telerehabilitation (internet-based) (Frederix et al., 2015). The program of MST reacted to barriers of adherence that were defined earlier such as travel difficulties, inconvenient scheduling and a one-fits-all approach (Clark et al., 2015). Benefits of the current program that are likely to cause the relatively good adherence seem to be the accessibility, flexibility and the tailoring of the online program. Another reason for better adherence could be the duration of the program. Earlier research found adherence to be better in short interventions (3 month) compared to long-term interventions (6 month) (Clark et al., 2015). With 6 weeks the duration of our intervention is short and could promote good adherence.

Although adherence in our study was better compared to earlier research about cardiac rehabilitation, there are still 34% of patients whose adherence to the exercises was low (<58%), so improvement is needed. Reasons for poor adherence in these patients could be a lack of motivational factors in the e-Health program. When looking at key features of existing

successful programs, a promising component is regular motivational feedback from the physiotherapist or the program itself (Cruz, Brooks, & Marques, 2014). For example, the system could give feedback on how good the patient is using the program by displaying smileys at the moment of log-in and when the patient has completed an exercise (e.g. a sun if they are diligent and a sleepy head if they are not using the program as intended). This computer-human dialogue is called praise and found to be an effective motivational tool (Oinas-Kukkonen & Harjumaa, 2009).

Furthermore, the self-management component might be too small. E-Health with large self-management components is found to have better adherence than programs that lack self-management (Cruz et al., 2014). Self-management components often include that the program keeps track of the performance of the user and displays the progress. This motivates the user to achieve his/her goals and use the program continuously (Oinas-Kukkonen & Harjumaa, 2009). It could be implemented in the current e-Health program by a virtual reward system. For example the system could give one star for every prescribed exercise that is completed. Thereby the system gives credit for performing the target behaviour. A mean score for every week, calculated by prescribed exercises relative to performed exercises, could be displayed in a curve-chart, to indicate the progress of the patient over time (figure 4). The collection of stars by participants could then be combined with a social comparison component in the system, displaying another curve with average mean scores of all other patients (figure 4). Thereby patients can compare their performance with others and see if they perform under or above average. It is expected that social comparison motivates patients to perform the target behaviour, by social influence of other patients who performed the same behaviour (Oinas-Kukkonen & Harjumaa, 2009).

Moreover, social contact is associated with better adherence in e-Health interventions and can be implemented in form of computer mediated persuasion, this could be a forum that facilitates patients exchange about their experiences, the amount of stars they have collected and possible barriers with the cardiac rehabilitation program (Oinas-Kukkonen & Harjumaa, 2009).

In addition, technophobia could explain obstacles in some patients, because this is defined as a barrier by Cruz et al (2014) and some patients in our study experienced computer problems. In order to react on technophobia, an introductory workshop about the use of the program could be offered before the start of the program. Additionally patients should have a help-service in form of a contact person, if they have difficulties with the program, this could be the designer of the program.

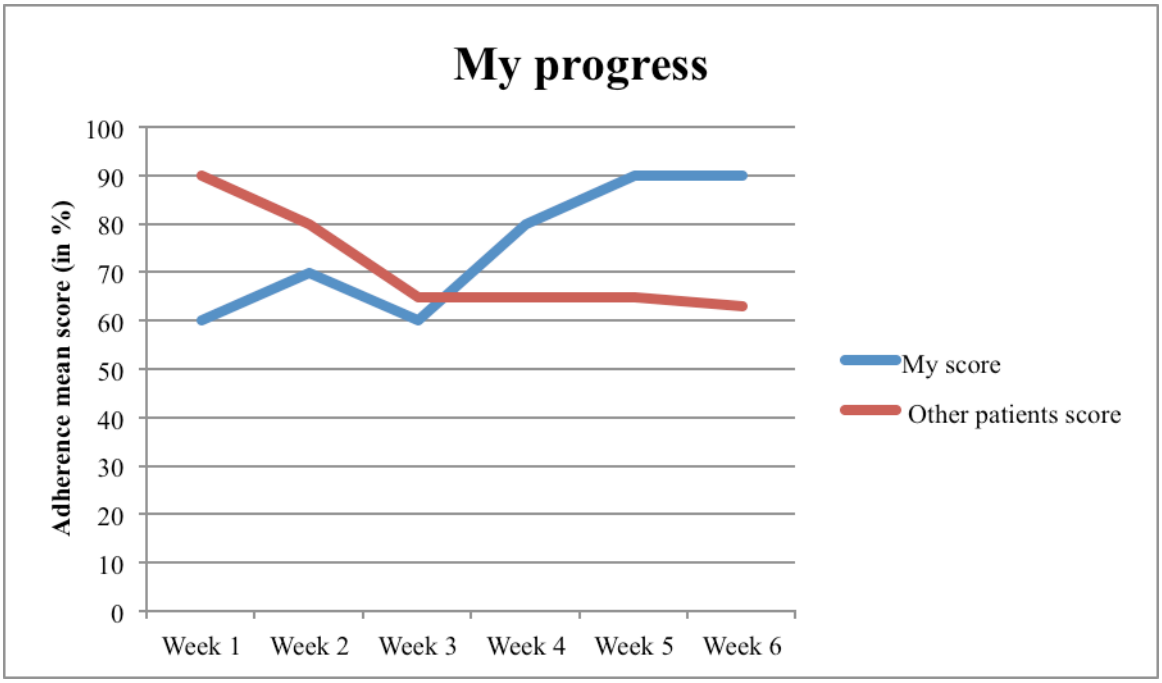

Figure 4: Illustration of a possible motivational component in the e-Health program: the personal adherence score and progress over time.

Relation of anxiety and depression with adherence

In contrast to our expectations, no significant relationship was found of anxiety or depression with adherence. Patients performed the prescribed exercises independent of their anxiety and depression symptoms.

Depression: A meta-analysis found depression to be a predictor of poor adherence to treatment recommendations and prescribed exercises in medical treatment (DiMatteo et al., 2000). The contrariness to our findings can be attributed to differences in study design. First, the majority of programs evaluated by DiMatteo et al. (2000) were about adherence to medication and just a few studies looked at adherence to exercise treatments. Second, the sample differed from our study, because DiMatteo et al. (2000) included patients with different diseases and not specifically cardiovascular disease patients. Third, DiMatteo et al. (2000) associated poor adherence of depressive patients with their lack of positive expectations and beliefs about the beneficial effect of the treatment. In our study, only patients who were willing to use the program are included. So, participants already decided in favour of the program when they started with the intervention. This can be associated with a motivation to use the program and beneficial outcome expectations in our participants.

Finally, in our study only 3 patients had an abnormal score for depression, what makes justified assumptions on basis of these patients impossible.

Anxiety: Similar to our findings, the review study found no significant predicting value for the association between anxiety and adherence to medical treatment in patients (DiMatteo et al., 2000). Farley et al. (2003) found high scores for anxiety to predict non-attendance in cardiac rehabilitation programs. His results suggest that this is an avoidance or denial style for coping with the disease. Although non-attendance cannot be equated with poor adherence, it can be expected that denial styles are present in anxious patients and this might be a possible reason for poor adherence.
Differences in findings can be attributed to the heterogeneous construct of anxiety. The symptoms can range from panic, which might not be related to health and has no effect on adherence, to obsessive-compulsive disorder and generalized anxiety about health which would have a positive effect on adherence (DiMatteo et al., 2000). In addition symptoms of depression co-occur in patients with anxiety and therefore it is not surprising that no negative effect on adherence was found for anxiety, since no effect for depression was found either.

It was chosen to improve the overall adherence in general and not specifically for the group of anxious and depressive patients, since this study found no association between anxiety or depression and adherence to the exercises.

Relation of age with adherence
A statistically significant relation between age and adherence behaviour was found. Older patients were more likely to perform the exercises as recommended by their physiotherapist. With every extra life year, adherence to the exercises increased with 1.1%.

The positive correlation between age and adherence was not expected from literature research. It stays in contrast to the findings of Jackson et al. (2005) who associated older age with a limiting uptake of a cardiac rehabilitation programme. First, the discrepancy in findings could be explained by the differences in the form of CR programs. Jackson et al. (2005) evaluated a standard centre-based CRP. The fact that our program is home-based could explain that adherence increases with age in our study, because older patients prefer home-based programs (Jackson et al. 2005).

Second, the nature of the program could be another reason for the differences in finding, since older patients are associated with a lower fitness at baseline that causes

problems of exercise uptake (Jackson et al., 2002). The program of MST reacts on this barrier by tailoring the exercise level to the baseline fitness of each patient.

Third, older patients are more likely to be widowed, which is associated with lower adherence due to the lack of social support (Capomolla et al, 2002). However, this factor might not be applicable in our study, since most of the older participants were married.

Fourth, Jackson et al. (2005) defined adherence as "percentage of sessions attended", which is different to adherence in terms of "performed exercises as recommended" as it is defined in our study. The difference in definition of adherence could account for the differences in findings, since Jackson et al. (2005) looked at the amount of sessions performed (capacity) and we examined if patients performed the exercises that were recommended (intended use). So, older patients might be more compliant to medical expert recommendations (such as prescribed exercises). This could be attributed to the difference in generation they were born in and the corresponding attitude about medical recommendations. They come from the days of "doctor knows best", when patients blindly trusted in the expertise of the physician. This attitude is contrary to todays trend of an "expert patient", who wants to be part in the decision-making regarding their treatment (Rowe & Calnan, 2006). So, a lower level of trust in the program might account for lower level of adherence to the exercises in younger patients. In order to enhance trust in the program, some design principles for system credibility support can be implemented. The principle "Verifiability" aims to verify the accuracy of information provided on the website by outside-sources (Oinas-Kukkonen & Harjumaa, 2009). In our online program links to external websites that support the knowledge provided could be given. Those should be references with authority such as the government health office to enhance the power of persuasion (Oinas-Kukkonen & Harjumaa, 2009). In addition, the design principle "Recognition" can be added as a source for social support. Public recognition of people who performed the target behaviour increases the likelihood that another person adopts that behaviour (Oinas-Kukkonen & Harjumaa, 2009). In our system personal stories of patients who successfully finished the e-Health CRP could be published on the website. The younger "expert" patient wants to inform himself/herself by different sources and build an opinion on basis of the information. This can be supported by the system providing information from different sources (external authorities, personal stories). It makes the information provided less subjective and it is expected that thereby the patient is less sceptic. The system would be more credible and thus more persuasive what could result in a more favourable attitude towards the e-Health program.

Relation of demographics with adherence

The findings about the lack of association between demographics (gender, highest education, marital status, work status) and adherence to exercises are contrary to the expectations. In our study, female participants adhered as good as male participants. Also patients did not differ in their adherence to the exercises with regard to their education, marital status and work status. This is contrary to earlier studies and it must be noted that these variables were referred to as main predictors of adherence by other researchers. A possible explanation for this difference is that the program of MST reacts to barriers of adherence that were defined for demographic differences. That includes the flexibility in scheduling and tailoring of the program to the characteristics of the patients. It seemed for example that women have lower initial exercise capacity, compared to men which is associated with lower adherence to exercise based CR in women (Jackson et al., 2005). MST reacted to that factor by tailoring the intensity of the program to the individual needs of their patients. For this reason the e-Health program of MST might not be as sensitive to demographic differences as other programs are.

Strong points

Strengths of this study include the uniqueness of the program evaluated. Many previous studies of internet-based CRPs did not investigate the benefits of those programs in early rehabilitation. Therefore our study extends other work by showing that exercise-based e-Health is beneficial for adherence behaviour also at an early stage.

Moreover, the use of log-data is a strong point, because it is an objective instrument and is not biased by self-reported data of the patient. In addition the way we analysed the log-data was better than in other studies, because we compared log-data with the recommended exercises and thereby measured the degree in which patients adhered in terms of intended use. Earlier research just looked at the amount of exercises performed, which can not be equated with a beneficial health outcome.

Limitations

First, compared to other studies, our study had a small sample size. Therefore our findings may not be strong enough in detecting smaller effect sizes for example the effect of anxiety and depression on adherence.

Second, the way log-data was measured within this study was very sensitive for human error. Log-data was gathered by participants clicking on a button under the exercise video presented in the online program, after they finished an exercise. Some patients reported

that they sometimes forgot to click on the button. On the one hand, the overall adherence would have been higher than indicated by the program. On the other hand, there might be patients who clicked on the button, without performing the exercise or who did not perform the exercise as recommended (e.g. less repetition than prescribed). The unreliability of log-data has a negative effect on the accuracy of the results, which include the total adherence scores. A more reliable method would be an automated system that indicates log-data, because it would be less sensitive for human error.

Third, data of patients who stopped with the intervention were removed from the data set. Depending on the reason for their dropout, patients would be part of the low adherence group and should not be excluded from the study. (1) Patients who willingly stopped with the intervention out of dislike should, in future studies, be ascribed a low adherence score and be considered for further analysis. (2) Dropouts due to health problems (e.g. COPD) should be deleted from the dataset and should not be included in the study. No assumption can be made about their continuous usage behaviour and their adherence score would not be comparable with patients who followed the program until the end of it. The results of our research question might be different if the first group of dropout patients had been included, because the group of participants with low adherence scores would be larger. It would have been particularly interesting to look at the demographic characteristics as well as anxiety and depression scores of patients who dropped out. Also we could have compared drop-out patients with non drop-out patients with respect to their characteristics. Additional information about factors that lead to low adherence would have been gathered by including these patients that are currently missing.

Follow-up studies

It would be interesting to take a closer look at the predicting value of age for adherence to exercise programs in CVD patients. A follow-up study could investigate factors that contribute to good usage behaviour in older patients and a poorer adherence in younger patients, especially with respect to treatment trust. This could be done by adding a qualitative study design to the current study, namely interviewing the patients about what they liked about the program and what they did not liked. The answers have to be coded and on basis of frequently occurring factors, a revised version of the program should be implemented. This method is not perfect, because some aspects that demotivated patients might be unconscious. Therefore the program improvements on basis of the current findings, as mentioned earlier,

have to be implemented (verifiability, authority, recognition) and the revised version of the program should be evaluated with regard to adherence.

Moreover, analyses about dropouts should be included and their demographics should be analysed, so characteristics of at risk groups are known. Individual reasons for drop-outs should be investigated and common patterns could be identified as possible obstacles, which can be avoided in future programs. In addition data of the current study can be reanalysed, including adherence scores for dropout patients, in order to investigate reasons for stopping with the program.

Furthermore, it would be interesting to conduct research about the differences in adherence between the online CRP of MST and a comparable centre-based CR, in order to investigate possible benefits of e-Health in early cardiac rehabilitation. It is then important that the rehabilitation programs are comparable. Therefore they have to start at the same time (first days after discharge from the hospital). Also the exercises included in the programs should be similar. In order to obtain total adherence scores in the control group (centre-based CR), the physiotherapist would keep record of the actual participation of patients and compare it with the prescribed rehabilitation sessions. A total adherence score could be calculated that is comparable to the adherence score of the intervention group (online program). Total adherence scores of the control group that receives early centre-based CR would be compared with total adherence scores of the intervention group who followed the online program.

Also, more studies about early CR programs should be conducted, because it has great beneficial potential compared to programs that start at a later moment (6 weeks after discharge from the hospital). Especially with regard to adherence, early CR programs are advantageous (Parker et al., 2011; Dafoe et al., 2006). The current study supports this point, since adherence to the early CR program of MST was found to be relatively good. Thus, more research on the strong points of the program with respect to early cardiac rehabilitation is needed.

Conclusion

In the current study symptoms of anxiety and depression in CVD patients did not play a role in their adherence to exercises in an early e-Health CRP. The difference in findings compared to other studies can mainly be attributed to differences in the study design. An early start with exercise-based cardiac rehabilitation combined with e-Health made our program unique and no comparable studies were found. In addition, this report provides novel empirical findings about the prediction of adherence to exercises in early CR by the age of the patients, as older

patients showed better adherence to the recommended behaviour. Overall adherence was good (63%). However, patients in our study were motivated to use the program, because they decided in favour of the program as they agreed to participate in the study. Considering that a motivated group of patients used the intervention, it is questionable why still 34% showed poor adherence. Something must have demotivated them along the way. In order to further improve adherence, the current study provides clear persuasive system design principles that should be implemented in a revised version of the program. A follow-up study should evaluate if adherence improves in the modified program, aiming to design a successful e-Health cardiac rehabilitation program.

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Appendix A: Dutch version of the Hospital Anxiety and Depression Scale (HADS)

Naam: Leeftijd:
Geslacht: Datum:

Het is bekend dat emoties bij de meeste ziektes een belangrijke rol kunnen spelen.
Deze vragenlijst dient als hulpmiddel om te weten te komen hoe u zich voelt. Lees iedere vraag en onderstreep het antwoord dat het beste weergeeft hoe u zich **gedurende de laatste week** gevoeld heeft.
Denk niet te lang na over uw antwoord. Uw eerste reactie op elke vraag is waarschijnlijk betrouwbaarder dan een lang doordacht antwoord.

1. **Ik voel me gespannen**:
Meestal
Vaak
Af en toe, soms
Helemaal niet

2. **Ik geniet nog steeds van de dingen waar ik vroeger van genoot**:
Zeker zo veel
Niet zo veel als vroeger
Weinig
Haast helemaal niet

3. **Ik krijg een soort angstgevoel alsof er elk moment iets vreselijks zal gebeuren**:
Heel zeker en vrij erg
Ja, maar niet zo erg
Een beetje, maar ik maak me er geen zorgen over
Helemaal niet

4. **Ik kan lachen en de dingen van de vrolijke kant zien**:
Net zoveel als vroeger
Niet zo goed als vroeger
Beslist niet zoveel als vroeger

Helemaal niet

5. **Ik maak me vaak ongerust**:

Heel erg vaak

Vaak

Af en toe maar niet te vaak

Alleen soms

6. **Ik voel me opgewekt**:

Helemaal niet

Niet vaak

Soms

Meestal

7. **Ik kan rustig zitten en me ontspannen**:

Zeker

Meestal

Niet vaak

Helemaal niet

8. **Ik voel me alsof alles moeizamer gaat**:

Bijna altijd

Heel vaak

Soms

Helemaal niet

9. **Ik krijg een soort benauwd, gespannen gevoel in mijn maag**:

Helemaal niet

Soms

Vrij vaak

Heel vaak

10. **Ik heb geen interesse meer in mijn uiterlijk**:

Zeker

Niet meer zoveel als ik zou moeten

Waarschijnlijk niet zoveel

Evenveel interesse als vroeger

11. **Ik voel me rusteloos en voel dat ik iets te doen moet hebben**:

Heel erg

Tamelijk veel

Niet erg veel

Helemaal niet

12. **Ik verheug me van tevoren al op dingen**:

Net zoveel als vroeger

Een beetje minder dan vroeger

Zeker minder dan vroeger

Bijna nooit

13. **Ik krijg plotseling gevoelens van panische angst**:

Zeer vaak

Tamelijk vaak

Niet erg vaak

Helemaal niet

14. **Ik kan van een goed boek genieten, of van een radio- of televisieprogramma**:

Vaak

Soms

Niet vaak

Heel zelden

Wilt u controleren of u alle vragen beantwoord heeft? BEDANKT.

Ontwikkeld door Snaith & Zigmond (1994)

De hier afgedrukte HADS is een experimentele Nederlandstalige versie en mag alleen ten behoeve van wetenschappelijk onderzoek worden gebruikt:
Spinhoven, Ph., Ormel, J., Sloekers, P.P.A., Kempen, G.J.M., Speckens, A.E.M & Van Hemert, A.M. (1997). A validation study of the Hospital Anxiety and Depression Scale (HADS) in different groups of Dutch subjects. Psychological Medicine, 27, 363-370.
De officiële Engelstalige versie (en vertalingen) kunnen worden besteld via:
nferNelson, Unit 28, Bramble Road, Techno Trading Centre, Swindon, Wiltshire, SN2 8EZ, U.K. (http:/www.nfer-nelson.co.uk).

Appendix B: HADS Scoringsinstructies

Angstsubschaal

1. **Ik voel me gespannen**:

Meestal = 3

Vaak = 2

Af en toe, soms = 1

Helemaal niet = 0

3. **Ik krijg een soort angstgevoel alsof er elk moment iets vreselijks zal gebeuren**:

Heel zeker en vrij erg = 3

Ja, maar niet zo erg = 2

Een beetje, maar ik maak me er geen zorgen over = 1

Helemaal niet = 0

5. **Ik maak me vaak ongerust**:

Heel erg vaak = 3

Vaak = 2

Af en toe maar niet te vaak = 1

Alleen soms = 0

7. **Ik kan rustig zitten en me ontspannen**:

Zeker = 0

Meestal = 1

Niet vaak = 2

Helemaal niet = 3

9. **Ik krijg een soort benauwd, gespannen gevoel in mijn maag**:

Helemaal niet = 0

Soms = 1

Vrij vaak = 2

Heel vaak = 3

11. **Ik voel me rusteloos en voel dat ik iets te doen moet hebben**:

Heel erg = 3

Tamelijk veel = 2

Niet erg veel = 1

Helemaal niet = 0

13. **Ik krijg plotseling gevoelens van panische angst**:

Zeer vaak = 3

Tamelijk vaak = 2

Niet erg vaak = 1

Helemaal niet = 0

Scoringsinstructies - Depressiesubschaal

2. **Ik geniet nog steeds van de dingen waar ik vroeger van genoot**:

Zeker zo veel = 0

Niet zo veel als vroeger = 1

Weinig = 2

Haast helemaal niet = 3

4. **Ik kan lachen en de dingen van de vrolijke kant zien**:

Net zoveel als vroeger = 0

Niet zo goed als vroeger = 1

Beslist niet zoveel als vroeger = 2

Helemaal niet = 3

6. **Ik voel me opgewekt**:

Helemaal niet = 3

Niet vaak = 2

Soms = 1

Meestal = 0

8. **Ik voel me alsof alles moeizamer gaat**:

Bijna altijd = 3

Heel vaak = 2

Soms = 1

Helemaal niet = 0

10. **Ik heb geen interesse meer in mijn uiterlijk**:

Zeker = 3

Niet meer zoveel als ik zou moeten = 2

Waarschijnlijk niet zoveel = 1

Evenveel interesse als vroeger = 0

12. **Ik verheug me van tevoren al op dingen**:

Net zoveel als vroeger = 0

Een beetje minder dan vroeger = 1

Zeker minder dan vroeger = 2

Bijna nooit = 3

14. **Ik kan van een goed boek genieten, of van een radio- of televisieprogramma**:

Vaak = 0

Soms = 1

Niet vaak = 2

Heel zelden = 3