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# Psychosocial Predictors for Cardiac Rehabilitation Participation for Patients With Coronary Artery Disease

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## Abstract

### Aims

Cardiac rehabilitation (CR) is a class Ia recommendation by international guidelines. However, the participation remains disappointingly low. Multiple barriers were already identified. Nevertheless, the relationship with psychosocial factors remains unsettled. The aim of this study is to analyse the role of psychosocial factors in CR participation.

### Methods and results

A prospective study on 165 patients with a percutaneous coronary intervention. The main outcome was participation in a centre-based CR programme. The independent relationship between participation and optimism, type D personality, health literacy, depression, social support and self-efficacy.

A total number of 165 patients were included in the study of which 81 (49.1%) participated in a centre-based CR programme. Participants were predominantly male. Solely, patients participating in CR were significantly younger ( $P = 0.005$ ). Participants of CR had significantly higher levels of social support especially from their significant other ( $P = 0.020$ ) and family ( $P = 0.050$ ). Furthermore, the health literacy score was significantly higher in the participants group ( $P = 0.030$ ). A multiple logistic regression demonstrated that higher age, higher social support, not working, being obese and being able to drive a car were significant statistical predictors for CR participation.

### Conclusions

This study is one of the first to demonstrate the importance of optimism and social support in the participation of CR. Other well-known barriers for CR participation such as age, transport and scheduling issues were identified as barriers in this study.

## Introduction

Multiple trials have demonstrated the effectiveness and cost-effectiveness of cardiac rehabilitation (CR) for patients with coronary artery disease<sup>1,2</sup>. Therefore, international guidelines strongly recommended participation in centre-based CR programmes<sup>3</sup>. The goals of CR programmes are to reverse the physiological effects of coronary artery disease, to obtain clinical stabilisation, to optimise cardiovascular risk management, and to enhance the psychosocial and vocational status of participating patients<sup>4</sup>. Furthermore, there is increased focus on the psychological aspects of heart disease and quality of life. Although exercise training is the cornerstone of CR programmes, optimally, CR programmes should be comprehensive and comprise all core components<sup>4</sup>. Despite the obvious benefits, recent data reveals that participation in CR is only around 30-40% of eligible patients in Europe<sup>5</sup>. Important predictors for not participating are older age, unemployment, multiple comorbidities, female gender, and smoking status<sup>6</sup>. Other common barriers are lack of physician recommendation, misconceptions about effectiveness and practical barriers such as transport and scheduling issues<sup>7</sup>.

Previous studies have already demonstrated the association between optimism, social support, health literacy and personality factors and adverse cardiac outcomes<sup>8-10</sup>. It is well established that optimism, higher social support, and health literacy are linked with lower risk for angina, myocardial infarction, and cardiac death<sup>8,11</sup>. Optimism as a personality trait can be defined as a general tendency to expect positive outcomes in the future regardless of possible obstacles. Is a mental attitude characterized by hope and confidence in success and a positive future<sup>12</sup>.

Moreover, depression and negative emotions are linked with a higher incidence of adverse cardiovascular outcomes<sup>13</sup>. However, optimism, social support, and health literacy on CR participation is not yet extensively studied.

It is important to better understand how psychosocial factors influence participation. It is possible that patients with certain psychosocial factors need different information or approaches to motivate them to participate in centre-based CR programmes.

The aim of this study was to assess the differences in socio-demographic and psychosocial factors between participants and non-participants of CR. We hypothesize that psychosocial factors such as higher optimism, health literacy, and social support are linked with higher participation rates.

## Methodology

This study is a single-centre prospective observational study. The study protocol was approved by the local ethics committee and written consents were collected from the participating patients (BE2432020000028).

### Population and Intervention

The participants were patients diagnosed with coronary artery disease that underwent a percutaneous coronary intervention at the cardiology department in Jessa hospital (Hasselt, Belgium) on the day of inclusion for the present study. As part of routine care, patients were educated on the need for CR and the management of cardiovascular risk factors. Patients could independently decide if they wanted to participate in a centre-based CR programme. On the same day, patients were asked if they wanted to participate in the present study. Patients who

consented to participate were asked to complete the following questionnaires on a tablet on the day of inclusion:

- Life Orientation Test-Revised<sup>14</sup> (LOT-R)

This is a 10-item scale that measures how optimistic or pessimistic people feel about the future.

- Multidimensional Scale of Perceived Social Support<sup>15</sup> (MSPSS)

This is a 12-item measure of perceived adequacy of social support from three sources: family, friends, and significant other.

- Patient Health Questionnaire<sup>16</sup> (PHQ-9)

This is a 9-item standard instrument for diagnosing depression in primary care

- General Self-Efficacy Scale<sup>17</sup> (GSE)

This scale is a 10-item self-report measure of self-efficacy.

- Distressed Personality Scale<sup>18</sup> (DS-14)

This scale assesses the presence of distressed personality.

- European Health Literacy Survey Questionnaire<sup>19</sup> (HLS-EU-Q16)

The HLS-EU-Q16 contains 16 items addressing self-reported difficulties in accessing, understanding, appraising and applying information to tasks related with making decisions in health care, disease prevention, and health promotion<sup>19</sup>.

Clinical and socio-demographic baseline characteristics were recorded from the electronic medical records of the patient. The participation in a centre-based CR programmes was recorded from the electronic medical record of the patient. The intention-to-treat principle was used.

### Cardiac rehabilitation

The multidisciplinary ambulatory rehabilitation programme in Belgium typically starts one or two weeks after hospital discharge, for a total duration of 12 weeks. The maximal number of reimbursed CR sessions is 45. The rehabilitation programme consists of resistance and exercise training: each week two to three one-hour aerobic exercise training sessions (treadmill, cycling and arm cranking). The patients trained at their ventilatory threshold level, tested by maximal cardiopulmonary exercise testing (V-slope method). All patients received psychological and dietary screening and counselling. If necessary, they were advised to participate in a smoking cessation programme. Furthermore, the rehabilitation programme comprises all other core components of CR from the recent position paper of the Secondary Prevention and Rehabilitation Section of the European Association of Preventive Cardiology<sup>5</sup>. All patients were given the advice to exercise regularly. The standard follow-up of ischemic heart disease patients is a consultation every 12 months.

### Statistical Analysis

Data analysis was performed using SPSS (version 26) in the Department of Medicine & Life Sciences (Hasselt University, Hasselt, Belgium). Categorical data were characterised by number and percentage. Continuous data were characterised by mean  $\pm$  standard deviation and median. Shapiro-Wilk tests were used to assess the distribution of the data. Significances of

the differences between continuous variables were tested by independent sample T-test for normally distributed variables, and by the Mann-Whitney U test for not-normally distributed variables. The  $\chi^2$  test was used for comparison of categorical variables. Furthermore, a stepwise forward multiple logistic regression (with F probability to enter < 0.05 and probability to remove < 0.1) with all variables was used to identify predictors for participation in CR. P-value of less than .05 (2-tailed) was considered as statistically significant.

## Results

A total number of 165 patients were included in the study of which 81 (49.1%) participated in a centre-based CR programme. Participants were predominantly male. Baseline clinical status and the use of cardiovascular medications were similar in both groups. Solely, patients participating in CR were significantly younger ( $P = 0.005$ ). Table 1 provides an overview of the baseline characteristics.

Variable	All (n=165)	No Cardiac Rehab (n=84)	Cardiac Rehab (n=81)	P-value
Age	66.7 $\pm$ 9.4	68.8 $\pm$ 9.6	64.6 $\pm$ 8.8	<b>0.005</b>
Gender (female)	39 (23.6%)	24 (28.6%)	15 (18.5%)	0.129
Smoking status	29 (17.6%)	17 (20.2%)	12 (14.8%)	0.360
Obesity	57 (34.5%)	25 (29.8%)	32 (39.5%)	0.188
Diabetes mellitus	35 (21.2%)	18 (21.4%)	17 (21%)	0.945
Familial history	87 (52.7%)	40 (47.6%)	47 (58%)	0.181
Previous CVA	3 (1.8%)	3 (3.6%)	0 (0%)	0.087
Peripheral Artery Disease	12 (7.3%)	6 (7.1%)	6 (7.4%)	0.948
Prior PCI	54 (32.7%)	26 (31.9%)	28 (34.6%)	0.581
Prior CABG	12 (7.3%)	5 (6%)	7 (8.6%)	0.492
Atrial fibrillation	8 (4.8%)	6 (7.1%)	2 (2.5%)	0.168
Beta-blocker	84 (50.9%)	45 (54%)	39 (48.1%)	0.486
RAAS blockers	88 (53.3%)	41 (48.8%)	47 (58%)	0.236
Lipid-lowering drugs	144 (87.3%)	76 (90.5%)	68 (81%)	0.203
Antidepressant drugs	15 (9.1%)	10 (11.9%)	5 (6.2%)	0.200

Table 1. Baseline characteristics. CVA: cerebrovascular accident, PCI: percutaneous coronary intervention, CABG: coronary artery bypass grafting, RAAS: renin-angiotensin-aldosterone system

Table 2 demonstrates the social characteristics of both groups. There was no significant difference observed in educational attainment and employment status between the CR participants and non-participant. However, patients not participating in CR were significantly more often not able to drive a car.

Variable	All (n=165)	No Cardiac Rehab (n=84)	Cardiac Rehab (n=81)	P-value
Not driving a car	14 (8.4%)	12 (14.3%)	2 (2.5%)	<b>0.006</b>
Higher education	31 (18.8%)	13 (15.5%)	18 (22.2%)	0.267
Employed	40 (24.2%)	21 (25%)	19 (23.5%)	0.817

Table 2. Social characteristics.

In Table 3, the results of the questionnaires per group are defined. The categories that were evaluated were optimism, social support, depression, self-efficacy, health literacy and type D personality. Participants of CR had significantly higher levels of social support especially from their significant other and family. Furthermore, the health literacy score was significantly higher

in the participants group. No differences were observed between the two groups in self-efficacy, depression score and type D personality.

Variable	All (n=165)	No Cardiac Rehab (n=84)	Cardiac Rehab (n=81)	P-value
LOT-R (Optimism)	15 ± 3.1	14.6 ± 3.1	15.4 ± 3.1	0.101
<i>Low optimism</i>	52 (31.5%)	34 (40.5%)	18 (22.2%)	<b>0.030</b>
<i>Moderate optimism</i>	89 (53.9%)	38 (45.2%)	51 (63%)	
<i>High optimism</i>	18 (10.9)	8 (9.5%)	10 (12.3%)	
<i>Missing</i>	6 (6%)	4 (4.8%)	2 (2.5%)	
MSPSS (Social support)	59.1 ± 11.4	56.8 ± 12.3	61.6 ± 9.9	<b>0.009</b>
MSPSS (Significant other)	6.1 ± 1	6 ± 1	6.3 ± 0.9	<b>0.020</b>
MSPSS (Family)	5.9 ± 1.2	5.7 ± 1.4	6.1 ± 1	<b>0.050</b>
MSPSS (Friends)	5.8 ± 1.2	5.6 ± 1.3	6 ± 1	0.053
PHQ-9 (Depression)	4.1 ± 4.1	4 ± 3.9	4.1 ± 4.4	0.878
<i>None- Minimal</i>	107 (64.8%)	54 (64.3%)	53 (65.4%)	0.863
<i>Mild</i>	39 (23.6%)	21 (25%)	18 (22.2%)	
<i>Moderate</i>	13 (7.9%)	6 (7.1%)	7 (8.6%)	
<i>Moderately severe</i>	4 (2.4%)	2 (2.4%)	2 (2.5%)	
<i>Severe</i>	1 (0.6%)	0 (0%)	1 (1.2%)	
GSE (Self-efficacy)	21.7 ± 4.2	21.2 ± 4.5	22.1 ± 3.8	0.200
HLS-EU-Q16 (Health literacy)	13.2 ± 2.8	12.7 ± 2.9	13.6 ± 2.6	<b>0.030</b>
<i>Inadequate</i>	12 (7.3%)	9 (10.7%)	3 (3.7%)	0.128
<i>Problematic</i>	44 (26.7%)	24 (28.6%)	20 (24.7%)	
<i>Adequate</i>	107 (64.8%)	49 (58.3%)	58 (71.6%)	
<i>Missing</i>	2 (1.2%)	2 (2.4%)	0 (0%)	
DS-14 (Type D)	18.8 ± 7.7	19.1 ± 7.3	18.4 ± 8.1	0.567
<i>Type D</i>	52 (31.5%)	28 (33.3%)	24 (29.6%)	0.609

Table 3. Outcomes of questionnaires

In Table 4, results of the multiple logistic regression analysis are depicted. Higher age, higher social support, not working, being obese and being able to drive a car were significant statistical predictors for participation.

	OR (95% CI)	P- value
MSPSS (Social support)	1.04 (1.01-1.08)	<b>0.019</b>
Age	0.96 (0.92-0.99)	<b>&lt;0.001</b>
Not driving a car	10.32 (1.87-56.8)	<b>0.007</b>
Obesity	2.33 (1.08-5.1)	<b>0.032</b>
Employed	0.15 (0.04-0.48)	<b>0.001</b>

R<sup>2</sup> = 0.418

Table 4. Multiple logistic regression with forward selection for the participation to a CR programme.

## Discussion

This study demonstrates again that the participation rates for CR are disappointingly low. In this cohort, only 50% of the patients participated in cardiac rehabilitation. While this is better than the European average, it still means that a large proportion of patients miss out on an effective intervention to reduce long-term morbidity and mortality<sup>5</sup>.

Previous studies have already highlighted several predictors for non-participation<sup>6,7</sup>. Common barriers reported in those studies such as age, scheduling and transport issues were also significant predictors in our study.

This study demonstrates that CR participants had a significant higher health literacy. This is in contrast with previous studies which demonstrated that health literacy was not linked with higher participation rates<sup>20</sup>. The fact that higher health literacy was linked with participation in our study highlights the importance of sufficient education for patients with recent heart disease. The importance of education was also highlighted in a recent paper proving that a smartphone application with education and live health coaches yielded similarly high engagement and safely increased attendance in cardiac rehabilitation<sup>21</sup>.

This study is one of the first to investigate the psychosocial factors related to CR participation. In contrast to earlier studies, type D personality was not significantly associated with CR participation in this cohort. Optimism is well-known as a significant predictor for cardiovascular outcomes. However, this study is one of the first to also demonstrate that participants of CR have less often a low level of optimism. Furthermore, this study also highlighted the importance of higher levels of social support by family or other significant others. Previous studies already demonstrated the importance of social support as vital aspect of coping mechanisms<sup>22</sup>. The results of this study suggest that psychosocial factors such as optimism and social support are a potential target for interventions at an early stage. This corresponds with the literature that demonstrates that optimism could be a potential target for intervention due to the link with future cardiovascular events<sup>8</sup>. Future research is needed if the trait optimism can be improved to ameliorate the participation and results of CR.

it is important to screen for psychosocial factors such as optimism and social support. More research is needed which health professional is most suited to take up this role. We plan based on the results of this study to have a social nurse present at the moment of CR referral to better map the psychosocial status of the patients. The social nurse can help with tackling common barriers such as transport and social support.

Lastly, telerehabilitation interventions could be a potential solution to lower the impact of these barriers. However, a recent study has shown that still a large proportion of non-participants will not participate in a telerehabilitation programme<sup>23</sup>.

## **Conclusions**

In conclusion, this study is one of the first to demonstrate the importance of optimism and social support in the participation of CR. Other well-known barriers for CR participation such as age, transport and scheduling issues were identified as barriers in this study. Screening and a more prominent role for social nurses and psychologists in phase I CR could potentially increase participation rates.

## **Conflict of interest**

Nothing to declare.

## **Data availability statement**

Data available on request.

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None.



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