



Optimism measured pre-operatively is associated with reduced pain intensity and physical symptom reporting after coronary artery bypass graft surgery



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ABSTRACT

Objective: Optimism is thought to be associated with long-term favourable outcomes for patients undergoing coronary artery bypass graft (CABG) surgery. Our objective was to examine the association between optimism and post-operative pain and physical symptoms in CABG patients.

Methods: We assessed optimism pre-operatively in 197 adults undergoing CABG surgery, and then followed them up 6–8 weeks after the procedure to measure affective pain, pain intensity, and physical symptom reporting directly pertaining to CABG surgery.

Results: Greater optimism measured pre-operatively was significantly associated with lower pain intensity ($\beta = -0.150$, CI = -0.196 to -0.004 , $p = .042$) and fewer physical symptoms following surgery ($\beta = -0.287$, CI = -0.537 to -0.036 , $p = .025$), but not with affective pain, after controlling for demographic, clinical and behavioural covariates, including negative affectivity.

Conclusions: Optimism is a modest, yet significant, predictor of pain intensity and physical symptom reporting after CABG surgery. Having positive expectations may promote better recovery.

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Introduction

Optimism is a psychological trait characterised by positive expectations about future outcomes. It is a significant predictor of physical health [1] and is associated with enhanced physical recovery in a number of conditions and procedures such as traumatic brain injury, lung cancer, breast cancer, and bone marrow transplant [2]. The protective effects of optimism also extend to both pain and physical symptom reporting, and negative associations between optimism and pain have been reported in a number of chronic illnesses [3–6]. Post-operative pain reporting is also lower among patients higher in optimism and this association has been demonstrated in patients who have undergone breast cancer surgery [7], and knee surgery [8,9]. However, optimism was not found to predict pain in a large sample of patients undergoing elective surgery [10] and in some cases pessimism is found to be the more robust predictor of post-operative pain [11,12].

Coronary artery bypass graft (CABG) surgery is a major procedure in terms of physical severity and patients typically experience pain and discomfort for up to 6 months after the operation [13]. A number of studies have examined the role of optimism in recovery following

CABG surgery. Optimism has been shown to predict lower rates of rehospitalisation following CABG surgery [14]. Patients higher in optimism have also been found to have a faster rate of physical recovery and a higher quality of life at both 6 months [15] and 8 months after surgery [16]. The association between optimism and pain has been examined previously in CABG patients. It was found that those higher in optimism post-operatively experienced less pain in the weeks following the procedure [12]. However, optimism was measured 2–3 days after surgery, so optimism was not assessed prospectively.

Therefore in the current study, we planned to extend the literature in two main ways. Firstly, optimism was measured approximately four weeks prior to surgery, thereby avoiding the confounding effects of the procedure, and providing a more accurate baseline measure of dispositional optimism. Secondly, in addition to pain, we also measured physical symptoms using a patient-based measure specifically designed to assess coronary revascularisation outcomes. This measure allowed us to explore associations between optimism, pain, and elements of recovery specific to CABG surgery which has not previously been tested in the literature. We hypothesised that patients with higher levels of optimism would have less pain and fewer physical symptoms specific to CABG surgery 4–6 weeks post-operatively, controlling for several clinical factors and negative affectivity – a trait thought to confound optimism effects [17].

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Method

Participants

The data we used in this study were collected as part of the Adjustment and Recovery after Cardiac Surgery (ARCS) Study. We carried out baseline assessments when patients attended the hospital for their pre-surgical clinic appointment on average 27.2 days before their surgery. Follow-up assessments took place on average 62.1 days after surgery and were carried out using postal questionnaires. Our inclusion criteria allowed only patients who were undergoing elective CABG surgery or CABG plus valve replacement to participate. CABG surgery included both on-pump and off-pump surgical procedures. Participants had to be able to complete the questionnaires in English, and be 18 years or older. All procedures were carried out with the written consent of the participants. Ethical approval was obtained from the National Research Ethics Service.

Participants were 265 prospective CABG patients who were recruited from a pre-surgery assessment clinic at St. George's Hospital, London. Follow-up data were collected 4–6 weeks after surgery from 215 patients; 2 patients had died, 13 had formally withdrawn from the study, and 35 did not respond to the follow-up questionnaires. Data on the three outcome measures were available for 201–215 patients. In order to carry out analyses of different outcomes on the same sample, we limited the analyses to 197 patients with complete data on all outcomes and covariates. There were no differences between patients who did and did not provide follow-up data in terms of age, gender distribution, ethnicity, smoking status, cardiological factors, total optimism levels, comorbidity or negative affectivity. But patients who were included in the analyses had lower body mass index (BMI) on average (28.3 versus 30.8, $p < 0.001$), and were less likely to have a history of diabetes (20.8% versus 36.9%, $p = 0.013$).

Measures

Predictor: optimism

Optimism was measured at baseline using the revised Life Orientation Test (LOT-R), a 10-item self-report questionnaire that evaluates generalised expectations of positive and negative outcomes [18]. Participants were asked to indicate the extent of their agreement with each item (e.g. 'In uncertain times, I usually expect the best') from 0 (*strongly disagree*) to 4 (*strongly agree*). Six items (three reverse-scored) were used to derive the total optimism score, so ratings can potentially range from 0 to 24, with higher scores indicating higher levels of optimism. The remaining four questions on the LOT-R are filler items. Cronbach's alpha for the LOT-R for this sample was 0.68.

In sensitivity analyses, we tested separate optimism and pessimism subscales by summing the three items pertaining to optimism and three items pertaining to pessimism respectively. Ratings for each subscale can range from 0 to 12. Cronbach's alpha for the optimism subscale was 0.64 and 0.66 for the pessimism subscale.

Outcomes: affective pain, pain intensity, and physical symptom reporting

Two components of the McGill Pain Questionnaire – Short Form (MPQ-SF) [19] were used to assess affective pain and pain intensity in this study. The MPQ-SF was developed as a brief version of the standard MPQ and is suitable for use in post-surgical patients. The first component of the MPQ-SF that we used measures affective pain and is comprised of a list of 4 affective (e.g. fearful) descriptor words for which respondents are asked to rate their current experience of that particular type of pain from 0 (*none*) to 3 (*severe*). Responses are summed, ranging from 0 to 12, with higher scores indicating higher levels of pain. Cronbach's alpha for the affective pain subscale was 0.80.

The second component of the MPQ-SF that we used measures current pain intensity using a visual analogue scale. Using an adapted version of this scale, patients were asked at the follow-up assessment to

rate their present pain intensity on a numerical rating scale ranging from 0 (*no pain*) to 10 (*worst possible pain*).

Physical symptoms were assessed at follow-up using the 11-item post-surgery physical symptom subscale from the Coronary Revascularisation Outcomes Questionnaire (CROQ) [20] designed for CABG surgery patients. This scale asks patients to rate the extent to which they have experienced certain physical symptoms related to their surgery such as bruising, numbness, tingling, and swelling, using a five-point Likert scale ranging from 0 (*not at all*) to 4 (*a lot*). For the purposes of this study, we removed three items from the CROQ that refer to pain in order to avoid confusion between physical symptoms and pain. Responses were summed, ranging from 0 to 32, with higher scores indicating greater negative symptoms. Cronbach's alpha for the 8-item CROQ physical symptom subscale for this sample was 0.71.

Covariates: clinical, sociodemographic, and psychosocial factors

Cardiovascular history and clinical factors during admission and management were obtained from clinical notes. Clinical risk was assessed using the European System for Cardiac Operative Risk Evaluation (EuroSCORE) [21]. EuroSCORE is a combined measure of procedural mortality risk based on 17 factors comprising patient-related factors (e.g. age, sex), cardiac-related factors (e.g. unstable angina, recent MI) and surgery-related factors (e.g. surgery on thoracic aorta). Items were scored in accordance with the 'logistic EuroSCORE' method to generate a percentage mortality risk estimate; further details of the scoring method can be found on the EuroSCORE website (www.euroscore.org/logisticEuroSCORE.htm). In addition, the number of grafts that a participant received and whether they underwent cardiopulmonary bypass (yes/no) were also recorded. History of diabetes was taken from medical notes, categorising patients as diabetic or non-diabetic.

Participants were asked to report any longstanding illnesses apart from heart disease prior to surgery (e.g. cancer, thyroid disorder); responses were summed to compute a chronic illness burden variable. Participants were asked to specify their ethnicity by selecting from the following options: white, black or black British, mixed, Chinese, Asian or Asian British, and other ethnic group. As the majority of patients were white (88.3%) we subsequently created a binary ethnicity variable where patients were reclassified into 'white' and 'non-white' categories. Smoking was measured as a binary variable (current smoker/non-smoker). Body mass index (BMI) was assessed at the pre-operative clinic appointment and calculated using the standard formula (kg/m^2).

Negative emotional style (NES) was assessed at baseline using a rating scale comprised of ten negative mood adjectives adapted from Cohen et al. [22]. Patients were required to rate how accurately each of the ten negative mood adjectives described how they felt during the past week using a 5-point Likert scale ranging from 1 (*I haven't felt this at all*) to 5 (*I felt this a lot*). Adjectives were derived from a factor analysis of affect items. NES comprised terms for anger (angry, hostile), depression (sad, unhappy), anxiety (tense, on edge), fatigue (tired, fatigued) and loneliness (isolated, lonely). Cronbach's alpha for the NES scale for this sample was 0.91.

Statistical analysis

Associations between variables were examined using Pearson's correlations for continuous data and one-way ANOVAs for categorical variables. Associations between dispositional optimism, pain and physical symptom reporting were modelled using multiple linear regressions. Participants with data available for all variables of interest were included in the analyses. We included covariates that might potentially relate to pain and physical symptom reporting including ethnicity, smoking, BMI, diabetes status, chronic disease burden, cardiopulmonary bypass, number of grafts, EuroSCORE, and NES. Results are presented as both standardised and unstandardised regression coefficients and the significance level was set to $p < .05$ for all analyses, with precise p values

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