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Interrelation and independence of positive and negative psychological constructs in predicting general treatment adherence in coronary artery patients — Results from the THORESCI study

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ABSTRACT

Background: In cardiac patients, positive psychological factors have been associated with improved medical and psychological outcomes. The current study examined the interrelation between and independence of multiple positive and negative psychological constructs. Furthermore, the potential added predictive value of positive psychological functioning regarding the prediction of patients' treatment adherence and participation in cardiac rehabilitation (CR) was investigated.
Method: 409 percutaneous coronary intervention (PCI) patients were included (mean age = 65.6 ± 9.5; 78% male). Self-report questionnaires were administered one month post-PCI. Positive psychological constructs included positive affect (GMS) and optimism (LOT-R); negative constructs were depression (PHQ-9, BDI), anxiety (GAD-7) and negative affect (GMS). Six months post-PCI self-reported general adherence (MOS) and CR participation were determined.
Results: Factor Analysis (Oblimin rotation) revealed two components ($r = -0.56$), reflecting positive and negative psychological constructs. Linear regression analyses showed that in unadjusted analyses both optimism and positive affect were associated with better general treatment adherence at six months ($p < 0.05$). In adjusted analyses, optimism's predictive values remained, independent of sex, age, PCI indication, depression and anxiety. Univariate logistic regression analysis showed that in patients with a cardiac history, positive affect was significantly associated with CR participation. After controlling for multiple covariates, this relation was no longer significant.
Conclusions: Positive and negative constructs should be considered as two distinct dimensions. Positive psychological constructs (i.e. optimism) may be of incremental value to negative psychological constructs in predicting patients' treatment adherence. A more complete view of a patients' psychological functioning will open new avenues for treatment. Additional research is needed to investigate the relationship between positive psychological factors and other cardiac outcomes, such as cardiac events and mortality.
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1. Introduction

Psychological risk factors play a substantial role in cardiac outcomes [1]. Both depression and anxiety are associated with development of cardiovascular diseases (CVD) [2,3]. Moreover, depression is considered a prognostic risk factor in patients with acute coronary syndrome [4]. Other detrimental psychological factors, such as perceived stress [5], hostility [6] and Type D personality [7] may also have a negative influence on incidence and course of multiple cardiovascular conditions and may act through several distinct psychobiological mechanisms that are directly involved in the pathogenesis of CVD [8].

Whereas past research has predominantly focused on the relationship between poor psychological functioning and cardiovascular health, more recent studies suggest cardiovascular health also to be related to positive psychological functioning [9–11]. Examples of such constructs are *Optimism*, which reflects the dispositional tendency to believe that good things will happen and to attribute causes of past events favorably [12], and *Positive affect* which refers to pleasant and activated mood

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states (e.g. happy, active) [13]. Both have been shown to predict an improved overall health status, better cardiac outcomes and reduced risk of cardiac mortality [9–11,14–16] independent of medical illness severity. However, other studies show contrasting findings, e.g. in stroke patients optimism was not associated with disease severity, recurrence or mortality [17].

However, former studies have mainly focused on individual psychological concepts, and knowledge about interrelations between and interactions of multiple negative and positive psychological constructs in heart patients is still lacking [9–11]. Where earlier research considered negative and positive psychological functioning as opposite ends of a continuum, suggesting that what was known about psychological distress was also applicable for positive psychological functioning [18], more recent research seems to support an "independence perspective". This new perspective presumes negative and positive psychological functioning to be separate, independent dimensions of mental health [18]. Although there may be some inverse correlation between particular positive and negative constructs, e.g. depression and optimism [19], absence of depression does not necessarily imply high positive affect, or optimism [9,14–16,18]. Additionally, psychological distress and positive psychological functioning have different biological and neural correlates [18,20], and in clinical situations, e.g., in long-term treatment of recurrent depression, promoting adequate positive psychosocial resources and reducing negative cognitions are considered separate treatment methods that are both needed [18].

In addition to the need for knowledge about interrelationships between and interactions of multiple negative and positive psychological constructs, more research about positive psychological constructs regarding prediction of cardiovascular outcomes is required [21]. It is for example unclear whether cardiac outcomes are more or less related to specific (clusters of) positive constructs, or whether all positive constructs should be considered one overall predictive factor [21]. Moreover, there is consistent evidence about constructs that may play a role in this relationship, for example about specific health behaviors including diet and exercise, which may be points of action during cardiac rehabilitation [21,22]. However, other modifiable health behaviors such as "adherence" (the degree to which a patient's behavior matches recommendations from a physician), which is a predictor of cardiovascular prognosis in the months following a cardiac event [23–25], might also be important in this relationship (e.g. as an intermediate outcome). Examining the relationship between positive psychological constructs and adherence might help building the theoretical framework explaining pathways between positive psychological functioning and cardiovascular outcomes. Besides, for clinical practice, understanding of the role of positive psychological well-being might provide new ways for intervention and help in designing tailor-made programs promoting a healthy lifestyle, e.g. a positive psychology intervention such as the online positive affect skills intervention [26–28].

Therefore, in the current study, the main aim was to investigate the interrelations between and independence of multiple positive (optimism, positive affect) and negative (anxiety, depression, negative affect) psychological constructs in a real-world cardiac population to explore the underlying structure. We also investigated whether the assessment of positive psychological factors is of incremental value to negative psychological functioning, regarding the prediction of treatment adherence and participation to cardiac rehabilitation.

2. Methods

2.1. Patient population and procedure – THORESCI study

The current study was part of a large prospective and ongoing observational cohort study, the "Tilburg Health Outcomes Registry of Emotional Stress after Coronary Intervention (THORESCI)", which recruits participants from the clinical standard of care Percutaneous Coronary Intervention (PCI) Registry at the Elisabeth-TweeSteden Hospital in Tilburg, the Netherlands. All patients who were scheduled for either elective or acute PCI for 1 or more coronary occlusions were included. Patients had to be over 18 and needed to have sufficient understanding of the Dutch language to fill out questionnaires. Sufferers from life-threatening comorbidities (e.g., metastasized cancer) or cognitive disorders were excluded. On the day of the PCI, patients were approached by a member of the research team who explained the study content and its requirements. After providing written consent, the patients were asked to fill out a set of validated psychosocial questionnaires at several moments post-PCI. For the current study, only data from baseline (within one week post PCI), from one month post PCI and from six months post PCI were used. All self-report questionnaires concerning emotional distress and positive psychological functioning were conducted one month after PCI. Furthermore, complete medical records were obtained. The study protocol is in line with the Helsinki declaration and was approved by the institutional medical ethics review board.

2.2. Emotional distress

2.2.1. Depression

One of the two instruments used to assess symptoms of depression was the reliable and valid Patient Health Questionnaire (PHQ-9) [29]. This measure consists of 9 items (e.g., "Little interest or pleasure in doing things"), based on the Diagnostic and Statistical Manual of Mental Disorders (DSM)-IV criteria of depression. Items are rated on a Likert scale from 0 ("not at all") to 3 ("almost every day") [29]. For major depressive disorder the recommended cut-off score is ≥10 [29]. In the present study, the internal consistency of the PHQ-9 at baseline was high (Cronbach alpha at 0.85). The second instrument to determine depression symptoms was the 21-item Beck's Depression Inventory (*BDI*). Cognitive and somatic items are rated on a Likert scale from 0 ("no depressive complaint") to 3 ("severe depressive complaint") [30]. The following cut-off scores are advised: <10 = no or minimal depression, 10–18 = mild to moderate depression, 19–29 = moderate to severe depression and 30–63 = severe depression [30]. In the present study, this questionnaire had high internal consistency (Cronbach alpha at 0.84).

2.2.2. Negative affect

Negative affect was assessed using the Global Mood Scale (GMS). This instrument comprises two subscales. For negative affect only the 10 negative affect terms (e.g., "fatigued" and "listless") were used [13]. Items are rated on a five-point Likert scale from 0 "not at all" to 4 "extremely". In the current study this scale had high internal consistency (Cronbach alpha at 0.89).

2.2.3. Anxiety

Anxiety symptoms were estimated using the Generalized Anxiety Disorder (GAD-7) scale, a valid and efficient tool to screen for generalized anxiety [31]. The seven items are scored on a Likert scale form 0 ("not at all"), to 3 ("almost every day") [31]. The recommended cut-off score is ≥10 [31]. In the current study, internal consistency was excellent (Cronbach alpha = 0.91).

2.3. Positive psychological functioning

2.3.1. Optimism

The Revised Life Orientation Test (*LOT-R*) was used to assess optimism. This questionnaire consists of ten statements, of which three are worded positively (e.g. "In uncertain times, I usually expect the best") and three negatively (e.g. "If something can go wrong, it will"). For the current study, we used all six items to create the LOT-R total score (range: 0–30), which we will call optimism throughout. The other 4 items are "filler" items. All items are rated on a 5 point Likert scale from 0 "I disagree a lot" to 5 "I agree a lot" [32]. Cronbach alpha for the optimism scale was 0.72.

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