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The effects of optimism and gratitude on adherence, functioning and mental health following an acute coronary syndrome★

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Abstract

Objective: This study examined the effects of optimism and gratitude on self-reported health behavior adherence, physical functioning and emotional well-being after an acute coronary syndrome (ACS).

Methods: Among 156 patients, we examined associations between optimism and gratitude measured 2 weeks post-ACS and 6-month outcomes: adherence to medical recommendations, mental and physical health-related quality of life (HRQoL), physical functioning, depressive symptoms and anxiety. Multivariable linear regression models were used, controlling for increasing levels of adjustment.

Results: Optimism [$\beta=.11$, standard error (S.E.)=.05, $P=.038$] and gratitude ($\beta=.10$, S.E.=.05, $P=.027$) at 2 weeks were associated with subsequent self-reported adherence to medical recommendations (diet, exercise, medication adherence, stress reduction) at 6 months in fully adjusted models. Two-week optimism and gratitude were associated with improvements in mental HRQoL (optimism: $\beta=.44$, S.E.=.13, $P=.001$; gratitude: $\beta=.33$, S.E.=.12, $P=.005$) and reductions in symptoms of depression (optimism: $\beta=-.11$, S.E.=.05, $P=.039$; gratitude: $\beta=-.10$, S.E.=.05, $P=.028$) and anxiety (optimism: $\beta=-.15$, S.E.=.05, $P=.004$; gratitude: $\beta=-.10$, S.E.=.05, $P=.034$) at 6 months.

Conclusion: Optimism and gratitude at 2 weeks post-ACS were associated with higher self-reported adherence and improved emotional well-being 6 months later, independent of negative emotional states. Optimism and gratitude may help recovery from an ACS. Interventions promoting these positive constructs could help improve adherence and well-being.

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Appendix A. Supplementary data

Supplementary data to this article can be found online at <http://dx.doi.org/10.1016/j.genhosppsy.2016.08.006>.

Keywords

Optimism; Gratitude; Acute coronary syndrome; Mental health; Adherence

1. Introduction

Over one million Americans suffer from an acute coronary syndrome (ACS: myocardial infarction or unstable angina) each year [1–5], and rates of rehospitalization and death in the following year are high [6]. Psychological well-being may improve cardiac-related outcomes, independent of cardiac risk factors and negative emotional states [7]. Optimism, defined as positive expectations about the future [8], is a relatively well-studied positive psychological construct. For example, optimism has been independently associated with improved functioning and superior cardiac health [9]. While optimism has been studied in depth in the cardiac and health behavior literature, less is known about other positive constructs. We therefore chose to explore another common positive psychological construct, gratitude. Gratitude is defined as noticing and appreciating the positive [10]. Gratitude is commonly experienced following an ACS [11] and may also have effects on health outcomes, but it has been less well studied in this context [10]. Gratitude can be a powerful positive feeling following a life-threatening event. There are indications that gratitude and gratitude interventions may improve well-being and some physical markers of cardiac health [12–14]. The present study seeks to explore whether these two positive emotions, optimism and gratitude, have similar effects on a variety of cardiac outcomes.

Several pathways have been hypothesized for the beneficial effects of positive psychological constructs on cardiac health. First, positive constructs may affect cardiovascular physiology. Negative psychological syndromes (e.g., depression) are associated with abnormal levels of inflammatory cytokines and related biomarkers that have been linked to adverse cardiac outcomes [15,16]. Positive psychological constructs have been linked to improvements in cardiac biomarkers, though the findings have been mixed [17–19]. Optimism and other positive constructs have also been more consistently associated with greater adherence to health behaviors, including healthy diet, physical activity and smoking cessation [7]. Greater levels of baseline psychological well-being may also protect from subsequent development of depression and anxiety [20], which may be important given the connections of these syndromes with adverse cardiovascular events following an ACS [21].

Though there is a substantial body of literature on the relationships between optimism and heart disease [7], there are less data available on gratitude in this context, despite its potential utility in understanding cardiac health. There is evidence to suggest that gratitude can influence a variety of cardiac-related outcomes, potentially mediated through emotions and behaviors such as sleep, self-efficacy, and mood. A conceptual model outlines these hypothesized relationships (Fig. 1).

No prior studies had simultaneously examined the prospective effects of multiple positive psychological constructs on a broad range of psychological, functional and adherence-based outcomes after an ACS. Accordingly, we examined associations between optimism and gratitude, measured 2 weeks post-ACS, and self-reported adherence to health behaviors,

physical functioning, health-related quality of life (HRQoL) and psychiatric outcomes (depression/anxiety) 6 months later. We hypothesized that both positive psychological constructs would be prospectively associated with these outcomes, independent of baseline levels of these outcome measures and multiple relevant covariates.

2. Methods

2.1. Study design and sample

The parent study (the Gratitude Research in Acute Coronary Events [GRACE] study) was a prospective observational study of the impact of gratitude and optimism on health-related outcomes among patients admitted for an ACS between September 2012 and January 2014 to one of three cardiac units at an urban academic medical center. Approval from our healthcare system's institutional review board was obtained prior to commencement of study procedures, and all participants underwent full written informed consent. Full study methods have been described elsewhere [22]. In a previous analysis from this trial, optimism (but not gratitude) measured 2 weeks post-ACS was associated with increased physical activity measured by accelerometer and reduced cardiac readmissions 6 months post-ACS [18]. The previous analysis did not examine the effects of optimism and gratitude on a broad range of self-reported clinical outcomes, which is the focus of the current analysis.

2.1.1. Measures—Baseline self-report measures were completed 2 weeks after hospital discharge. Follow-up measures were collected 6 months thereafter.

2.1.1.1. Positive psychological constructs. Optimism was measured using the well-validated six-item Life Orientation Test–Revised (LOT-R) [23]. Gratitude was measured using the validated six-item Gratitude Questionnaire-6 (GQ-6) [10].

2.1.1.2. Adherence. Four items from the Medical Outcomes Study Specific Adherence Scale (MOS SAS) [24] were used to measure self-reported frequency of adherence to diet, physical activity, stress reduction and medication over the past 2 weeks. The items were asked with the stem: “How often have you done each of the following in the past two weeks? 1) Cut down on stress in your life, 2) Exercised regularly, 3) Followed a low-fat, low-salt, or diabetic diet, 4) Took prescribed medication.” For each item, ratings were made on a 1–6 Likert/qualitative scale ranging from 1 (none of the time) to 6 (all of the time). This scale has been used to examine adherence in prior studies of cardiac patients [25].

2.1.1.3. Medical and functional status. The 12-item well-validated Medical Outcomes Study Short Form-12 (SF-12) [26] was used to measure mental (mental component score [MCS]) and physical (physical component score [PCS]) components of HRQoL. The Duke Activity Symptom Index (DASI) [27] was used to measure health-related limitations and physical function with 12 yes/no items. These scales have been used to assess these constructs in prior studies of patients with cardiac illness [28].

2.1.1.4. Depressive symptoms and anxiety. We assessed depressive symptoms with the well-validated Patient Health Questionnaire-9 (PHQ-9) [29]. The PHQ-9 inquires about the frequency of the nine symptoms of major depression in the prior 2 weeks and has good

sensitivity and specificity [30]. Anxiety was measured via the seven-item Hospital Anxiety and Depression Scale anxiety subscale (HADS-A) [31]. The HADS-A is designed for use with medically ill patients. It has few somatic symptom items and has been used in studies of patients with heart disease [32].

2.2. Statistical analyses

Multivariable linear regressions were used to examine the prospective associations between optimism and gratitude (in separate models) on each 6-month outcome. Four models, with increasing covariate adjustment, were used to assess associations. Model 1 included only the corresponding baseline value of the 6-month outcome variable (e.g., controlling for baseline adherence when looking at 6-month adherence as the outcome). Model 2 included each baseline value from model 1 plus sociodemographic factors: age, gender and race. Model 3 included all variables in the previous models plus medical severity indicators [Charlson comorbidity index [30], peak troponin T (a protein that indicates cardiac muscle damage used as a marker of ACS severity), prior ACS] and social (living alone) risk factors. Model 4 (full model) included all previous covariates (baseline demographic, medical and social risk factors as above), plus anxiety and depressive symptoms. Two supplemental analyses were run building on the full model (model 4): one including cardiac rehospitalizations and the other including spirituality as measured by the sum of four items from the Daily Spiritual Experiences Scale (DSES) [33], with results shown in Supplemental Table 1a and b.

All analyses were completed using Stata 11.2 (StataCorp, College Station, TX, USA). Statistical significance was set a priori at two-tailed $P < .05$. However, since two different positive psychology constructs (optimism and gratitude) were examined as independent variables in our analyses, findings with $P = .025$ (threshold for significance after Bonferroni correction [34]) should be interpreted with caution.

3. Results

Overall, 164 participants enrolled and completed baseline assessments at 2 weeks post-ACS; 156 (95%) completed all relevant self-report assessments and were included in analyses. Baseline demographic, medical and self-reported characteristics are listed in Table 1. Unadjusted (model 1) and fully adjusted regression results (model 4) are described in the text, with all model results presented in Table 2. For each regression result, the β coefficient represents the amount of change in the outcome variable (e.g., anxiety score) given a one-point increase on the optimism or gratitude scale.

In unadjusted analyses (model 1), 2-week optimism and gratitude were positively associated with 6-month health behavior adherence (MOS SAS) [optimism $\beta = .11$, standard error (S.E.) = .04, $P = .011$; gratitude $\beta = .09$, S.E. = .04, $P = .033$] and mental HRQoL (SF-12 MCS) (optimism $\beta = .53$, S.E. = .12, $P < .001$; gratitude $\beta = .42$, S.E. = .11, $P < .001$), and negatively associated with depressive symptoms (PHQ-9) (optimism $\beta = -.14$, S.E. = .05, $P = .004$; gratitude $\beta = -.10$, S.E. = .05, $P = .043$) and anxiety (HADS-A) (optimism $\beta = -.16$, S.E. = .05, $P = .001$; gratitude $\beta = -.09$, S.E. = .04, $P = .035$).

After adjusting for social, medical and psychiatric covariates (model 4), optimism ($\beta=.11$, S.E.=.05, $P=.038$) and gratitude ($\beta=.10$, S.E.=.05, $P=.027$) at 2 weeks post-ACS were associated with 6-month health behavior adherence (MOS SAS). Optimism ($\beta=.44$, S.E.=.13, $P=.001$) and gratitude ($\beta=.33$, S.E.=.12, $P=.005$) were also associated with 6-month mental HRQoL (SF-12 MCS). In contrast, neither optimism nor gratitude was significantly associated with physical HRQoL (SF-12 PCS) or functional status (DASI).

After adjusting for social and medical covariates, optimism at 2 weeks was associated with lower 6-month depressive symptoms (PHQ-9) ($\beta=-.11$, S.E.=.05, $P=.039$) and anxiety (HADS-A) ($\beta=-.15$, S.E.=.05, $P=.004$) scores. Gratitude at 2 weeks was also associated with lower depressive symptoms ($\beta=-.10$, S.E.=.05, $P=.028$) and anxiety ($\beta=-.10$, S.E.=.05, $P=.034$) scores.

Supplemental Table 1a shows the fully adjusted models with the addition of cardiac rehospitalizations. Most of the significant results did not change with this addition, with the exception that the depression outcome was slightly attenuated ($P<.05$ to $P<.10$). In Supplemental Table 1b, when adding spirituality (DSES items) to the full model, the effects of gratitude on adherence and mental HRQoL persisted, and the anxiety and depression results became marginally significant ($P<.10$).

4. Discussion

The present study found that optimism and gratitude following an ACS were associated with greater subsequent self-reported adherence to key cardiac health behaviors and mental HRQoL, as well as lower anxiety and depressive symptom scores. All significant associations remained after controlling for social and medical covariates. Notably, the associations with adherence and mental HRQoL were independent of concurrent negative psychological states (depressive symptoms and anxiety).

The connections between positive psychological constructs and HRQoL may be relevant to clinical care and outcomes in ACS patients. HRQoL is an important component of physical, social and psychological health that can impact functioning among cardiac patients [35,36]. HRQoL is sensitive to changes and linked with health behaviors and cardiac prognosis [37–39]. As the longevity of cardiac patients has increased over time, HRQoL is seen as an important outcome in its own right. The NHLBI emphasized this in a position paper indicating that they are “committed to supporting efforts to measure HQL [health-related quality of life] as an important end point in trials of cardiovascular interventions [...]” [40]. Further demonstrating its importance in research, HRQoL is now included in two major US epidemiological surveys, the National Health and Nutrition Examination and the Behavioral Risk Factor Surveillance System [36]. In the present study, the significant positive relationships between optimism and mental HRQoL were found across all models. These findings are consistent with previous studies, including a meta-analysis of optimism’s associations with HRQoL among cardiac patients [7]. The present study extends work in this area by demonstrating these relationships in high-risk patients following an ACS. This is also the first study to demonstrate a relationship between gratitude and mental HRQoL in a medically ill population, an area with much potential for further study.

The association of optimism with adherence to health behaviors is consistent with prior studies. Several studies have linked higher optimism with improved health behaviors like physical activity, medication adherence and adopting a heart-healthy diet [7,41–44]. In addition, the present findings are consistent with a prior analysis from this cohort, finding that optimism was associated with physical activity measured by accelerometer [18]. Adherence to health behaviors like physical activity reduces morbidity and mortality after ACS [45]. Thus, the optimism–physical activity association is promising when considering ways to improve health outcomes among cardiac patients.

A recent review indicated that although there are few gratitude intervention studies, most indicate promising results with respect to social and psychological outcomes [46]. In particular, gratitude interventions (e.g., recording daily gratitudes, behavioral expressions of gratitude) have been associated with improved well-being [47], reduced worry [48] and positive affect [49]. One intervention also led to greater physical activity and fewer self-reported physical symptoms [47]. In the gratitude intervention and physical health literature, one recent randomized controlled pilot trial examined a daily gratitude journaling intervention among cardiac patients and found preliminary indications that the intervention improved some markers of heart failure/cardiac prognosis (e.g., inflammation, parasympathetic heart rate variability) [13]. With these promising early findings and given the need for improved adherence post-ACS, more research on the effects of gratitude on health behaviors is needed, particularly in the context of cardiac patients. The present study is the first to demonstrate the association of gratitude with health behavior adherence in a medical or cardiac population.

Finally, this study found that baseline optimism and gratitude were associated with lower 6-month anxiety and depressive symptoms, independent of their baseline values. This finding has important implications for recovery because depression and anxiety are associated with poorer cardiac prognosis and mortality [50,51]. Depression following an ACS has been associated with recurrent cardiac events, rehospitalizations and morbidity [52–54]. Further, lower levels of depression and anxiety are linked to reduced rates of cardiac events and mortality [55]. The present finding that optimism and gratitude were associated with improved mental health states is important when considering ways to improve well-being and prognosis for high risk post-ACS patients.

In examining the magnitude of the regression effects found, there are several important considerations. First, there are no established clinical cutoffs for the measures of optimism (LOT-R) and gratitude (GQ-6) used in this study. Second, for several of the outcomes used (e.g., MOS SAS), there are very limited data on minimally clinically important differences (MCIDs). Third, for the outcomes used that do have MCID data (SF-12 for HRQoL, HADS-A for anxiety and PHQ-9 for depressive symptoms), relatively large differences in optimism and gratitude were required to see clinically important differences. For the SF-12, published data indicate that a 4- to 5-point score change is considered clinically significant [56]. In the present study, we found that an 8.5-point increase [1.5 standard deviation (S.D.)] in optimism (LOT-R) or 10.2-point increase (1.75 S.D.) in gratitude (GQ-6) would be required to meet this clinical significance threshold. Likewise, changes of >1 S.D. in optimism and

gratitude were required to see the 5-point change MCID for the PHQ-9 [57] and the 1.4-point change MCID for the HADS-A [58].

This observational study had several limitations, including a moderate sample size, potentially limiting power to identify associations and a largely white male sample from a single academic center, which could limit generalizability. Furthermore, all outcomes in this analysis were self-reported, and future studies could benefit from using objective measures of health behavior adherence and functioning. Other related and potentially relevant constructs were not included, such as prosocial behavior or perceived social support. Future studies would benefit from examining adherence to each specific health behavior and exploring the role of self-regulation or conscientiousness on these health behaviors.

Despite these limitations, this prospective study is the first to simultaneously examine the independent effects of two positive psychological constructs on a wide range of medical, functional and emotional outcomes in a high-risk post-ACS cohort. The analysis revealed independent contributions of optimism and gratitude to adherence, mental HRQoL, anxiety and depressive symptoms. This work also adds to the literature by describing the effects of gratitude on mental HRQoL and self-reported health behavior adherence in a medical population. If optimism, gratitude and related positive psychological constructs are associated with superior prognosis, research should examine whether interventions designed to cultivate positive psychological experiences can result in improved clinical outcomes. There has been limited work to-date in this area. In one randomized trial, a gratitude intervention led to greater physical activity in a nonmedical population [47]. In two randomized trials among hypertension and heart disease patients, a positive affect-based program was associated with improvements in physical activity and medication adherence [59,60]. The relationships between positive psychological constructs and HRQoL, health behavior adherence and reduced depressive symptoms and anxiety may begin to explain the associations of optimism and gratitude with superior cardiac prognosis. Future studies are warranted to determine whether intervention programs are effective and can modify prognosis among ACS patients.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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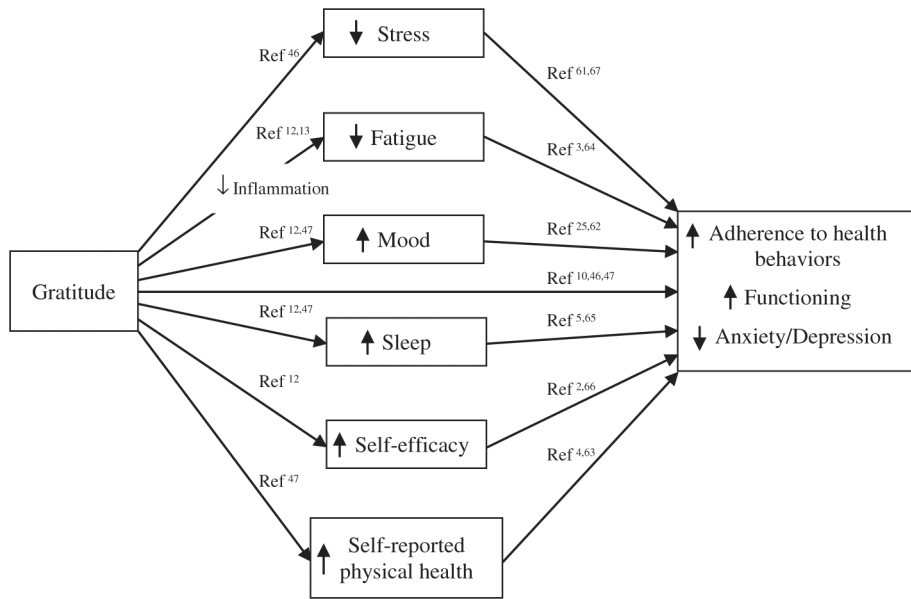


Fig. 1. Conceptual model of the relationships between gratitude and the outcomes used in this study.

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Table 1Baseline sociodemographic, functional, medical and emotional characteristics ($n=156$)

Variable	Mean (S.D.) or n (%) ^a
Demographic characteristics	
Age(y)	61.5 (10.6)
Male	137 (84) ^a
White	137 (84) ^a
Living alone	38 (23) ^a
Medical history	
First ACS	95 (58) ^a
Charlson Index (age-adjusted)	3.3 (1.6)
Peak troponin T (ng/ml)	1.5 (3.5)
Diagnosis: MI	85 (54.5)
BMI (kg/m ²)	28.7 (5.2)
Hypertension	98 (62.8)
Hyperlipidemia	126 (80.8)
Diabetes	29 (18.6)
Left ventricular ejection fraction	.58 (.1)
Self-report measures at baseline (range)	
Optimism (LOT-R) (1–24)	17.7 (5.6)
Gratitude (GQ-6) (6–42)	36.5 (5.8)
Adherence (MOS SAS) (4–24)	17.0 (3.1)
Physical Function (DASI) (0–58.2)	38.7 (15.8)
Physical HRQoL (SF-12 PCS) (0–100)	40.8 (10.4)
Mental HRQoL (SF-12 MCS) (0–100)	50.8 (9.2)
Depressive symptoms (PHQ-9) (0–27)	4.3 (4.4)
Anxiety (HADS-A) (0–21)	4.3 (4.0)

^aAll figures are reported as mean (S.D.) unless otherwise specified.

Associations between optimism and gratitude and self-report outcomes based on multivariable regressions ($n=156$)

Table 2

6-month outcome variable	2-week optimism (LOT-R), β (S.E.)				2-week gratitude (GQ-6), β (S.E.)			
	Model 1	Model 2	Model 3	Model 4	Model 1	Model 2	Model 3	Model 4
Adherence (MOS SAS)	.11* (.04)	.08* (.04)	.07 (.04)	.11* (.05) $R^2=0.29$	.09* (.04)	.07 [†] (.04)	.07 [†] (.04)	.10* (.05) $R^2=0.29$
Physical Function (DASI)	.23 (.16)	.33* (.16)	.21 (.15)	.12 (.17) $R^2=0.55$	.12 (.15)	.18 (.15)	.19 (.14)	.09 (.16) $R^2=0.55$
Physical HRQoL (SF-12 PCS)	.09 (.13)	.13 (.14)	.05 (.13)	-.02 (.15) $R^2=0.41$	.04 (.13)	.07 (.13)	.08 (.12)	.01 (.14) $R^2=0.41$
Mental HRQoL (SF-12 MCS)	.53*** (.12)	.50*** (.12)	.52*** (.12)	.44** (.13) $R^2=0.38$	.42*** (.11)	.41*** (.11)	.43*** (.11)	.33*** (.12) $R^2=0.37$
Depressive symptoms (PHQ-9)	-.14** (.05)	-.14** (.05)	-.13* (.05)	-.11* (.05) $R^2=0.51$	-.10* (.05)	-.10* (.05)	-.11* (.05)	-.10* (.05) $R^2=0.51$
Anxiety (HADS-A)	-.16*** (.05)	-.15*** (.05)	-.14*** (.05)	-.15*** (.05) $R^2=0.47$	-.09* (.04)	-.08 [†] (.04)	-.09* (.04)	-.10* (.05) $R^2=0.46$

Model 1: adjusted only for corresponding baseline value of the 6-month outcome variable. Model 2: as above plus age, gender, and race. Model 3: as above plus medical and social risk factors (Charlson comorbidity index, peak troponin T, prior ACS, living alone). Model 4: as above plus anxiety and depressive symptoms.

[†] $P<.10$

* $P<.05$.

** $P<.01$.

*** $P<.001$.