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Original Research Reports

Effects of Positive Psychology Interventions on Risk Biomarkers in Coronary Patients: A Randomized, Wait-List Controlled Pilot Trial

Gholam Reza Nikrahan, Ph.D., Johannes A.C. Laferton, Ph.D., Karim Asgari, Ph.D., Mehrdad Kalantari, Ph.D., Mohammad Reza Abedi, Ph.D., Ali Etesampour, M.D., Abbas Rezaei, Ph.D., Laura Suarez, M.D., Jeff C. Huffman, M.D.

Background: *Among cardiac patients, positive psychologic factors are consistently linked with superior clinical outcomes and improvement in key markers of inflammation and hypothalamic-pituitary-adrenal axis functioning. Further, positive psychology interventions (PPI) have effectively increased psychologic well-being in a wide variety of populations. However, there has been minimal study of PPIs in cardiac patients, and no prior study has evaluated their effect on key prognostic biomarkers of cardiac outcome. Accordingly, we investigated the effect of 3 distinct PPIs on risk biomarkers in cardiac patients.* **Methods:** *In an exploratory trial, 69 patients with recent coronary artery bypass graft surgery or percutaneous intervention were randomized to (1) one of three 6-week in-person PPIs (based on the work of Seligman, Lyubomirsky, or Fordyce) or (2) a wait-list control group. Risk biomarkers were assessed at baseline, postintervention (7 weeks), and at 15-week follow-up. Between-group differences in change from baseline biomarker levels were examined via random effects models.* **Results:** *Compared with the control group, participants randomized to the Seligman ($B = -2.06$; $p = 0.02$) and Fordyce PPI ($B = -1.54$; $p = 0.04$) had significantly lower high-sensitivity C-reactive protein levels at 7 weeks. Further, the Lyubomirsky PPI ($B = -245.86$; $p = 0.04$) was associated with a significantly lower cortisol awakening response at 7 weeks when compared with control participants. There were no other significant between-group differences.* **Conclusion:** *Despite being an exploratory pilot study with multiple between-group comparisons, this initial trial offers the first suggestion that PPIs might be effective in reducing risk biomarkers in high-risk cardiac patients.*

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All procedures followed were in accordance with the ethical standards of the responsible committee on human experimentation (institutional and national) and with the Helsinki Declaration of 1975, as revised in 2000. Informed consent was obtained from all patients for being included in the study.

Received December 8, 2015; revised February 22, 2016; accepted February 22, 2016. From Department of Psychology, University of Isfahan, Isfahan, Iran (GRN, KA, MK); Department of Psychology, Islamic Azad University of Borujen, Borujen, Iran (GRN); Department of Psychiatry, Brigham and Women's Hospital, Boston, MA (JACL); Department of Psychiatry, Harvard Medical School, Boston, MA (JACL, LS, JCH); Department of Consulting, University of Isfahan, Isfahan, Iran (MRA); Department of Internal Medicine, Najafabad Islamic Azad University, Najafabad, Iran (AE); Department of Immunology, Isfahan University of Medical Sciences, Isfahan, Iran (AR); Department of Psychiatry, Massachusetts General Hospital, Boston, MA (LS, JCH)Send correspondence and reprint requests to Gholam Reza Nikrahan, Ph.D., Department of Psychology, University of Isfahan, Hezarjarib St, Isfahan, Iran; e-mail: rezanikrahan@yahoo.com, nikrahan@edu.ui.ac.ir

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INTRODUCTION

Coronary artery disease (CAD) is the world's leading cause of death.[1] Psychologic factors play an important role in the morbidity and mortality associated with CAD. For example, depression in patients with CAD is associated with approximately double the risk of mortality and other adverse cardiac events, and these relationships are independent of traditional cardiac risk factors.[2–4] Anxiety is also prospectively associated with a higher risk of mortality and major cardiac events in patients with CAD.[5,6] However, interventions targeting these negative psychologic syndromes in patients with heart disease have shown limited effects on cardiac morbidity and mortality.[7,8]

In contrast, positive psychologic constructs are associated with superior cardiovascular outcomes.[9,10] Positive affect has been associated with beneficial cardiovascular health and possibly superior immune functioning.[11] Likewise, other positive constructs, including optimism,[12,13] vitality,[14,15] positive affect,[16,17] well-being,[18,19] and sense of control[20] have also been associated with reduced cardiac morbidity and mortality, along with improved status of physiologic markers of cardiac prognosis, in many cases independent of the adverse effects of negative psychologic states such as depression.[21]

The relationship between positive psychologic factors and cardiac outcomes is often considered to be mediated via 2 potential pathways: health behavior and physiologic mechanisms. Positive psychologic factors, measured at baseline, are associated with greater participation in key health behaviors, including following a healthy diet, smoking cessation, and increased physical exercise,[9,10] all of which are strongly related to cardiac outcome.[22] Though physiologic effects have been less well studied, positive psychologic factors have also been linked to adaptive hypothalamic-pituitary-adrenal (HPA) axis functioning and reduced inflammation.[23–25] Such findings may be important given that these markers are associated with adverse cardiac events and that HPA-axis dysfunction and inflammation may be mediational pathways by which depression leads to higher rates of mortality in patients with CAD.[26]

Positive psychology interventions (PPIs) use systematic exercises to cultivate positive effect, optimism, and other positive psychologic factors. PPIs have consistently reduced distress and improved well-being in healthy populations and patients with mental health symptoms.[27,28] However, despite the clear relationships between positive psychologic constructs and cardiac outcomes, very few studies so far have specifically investigated the application of PPIs in cardiac populations. In a small 3-arm pilot trial, an 8-week, telephone-based PPI led to greater (though nonsignificant) improvements in mood, anxiety, and quality of life when compared with both an active control group (Relaxation Response) or an attention-matched control group (a control condition that matches the amount of attention patients receive in the intervention condition, but lacks specific therapeutic content) among patients hospitalized for an acute coronary syndrome or heart failure.[29] Among patients who had just received a percutaneous coronary intervention, Peterson et al.[30] compared a positive affect/self-affirmation intervention to patient education alone. Patients in the positive affect/self-affirmation group had a significant increase in physical activity and a decrease in depressive symptoms, though there were no differences in rates of cardiac events and cardiac biomarkers.

The question of whether PPIs can lead to improvements in physiologic biomarkers associated with CAD progression and outcomes has remained unanswered. Accordingly, in this secondary analysis of a randomized controlled trial of 6-week PPIs in patients with CAD (in which PPIs led to significant improvements in psychologic outcomes[31]), we examined the effects of PPIs on inflammatory makers and HPA-axis function. We hypothesized that the PPIs would be associated with greater reductions of inflammatory markers and cortisol awakening response (CAR_g) postintervention, when compared with participants in the wait-list control condition.

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