Dimensional structure and correlates of posttraumatic stress symptoms following suspected acute coronary syndrome

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ABSTRACT

Background: Posttraumatic stress disorder (PTSD) is a heterogeneous construct, and some have suggested that PTSD triggered by acute coronary syndrome (ACS) may differ from PTSD due to prototypical traumas.

Methods: We conducted the first examination of the latent structure of PTSD symptoms after suspected ACS in 399 adults in the REactions to Acute Care and Hospitalization (REACH) study, an observational cohort study of patients recruited from the emergency department during evaluation for ACS. Using confirmatory factor analysis, we compared the 4-factor dysphoria, 4-factor numbing, and 5-factor dysphoric arousal models of PTSD.

Results: Although all models fit well, the dysphoria model was selected as the best-fitting model. Further, there was measurement invariance of the dysphoria model by sex. PTSD dimensions evidenced differential associations with indicators of threat perception during ACS evaluation and adherence to cardioprotective medication.

Limitations: One limitation of this investigation is the use of self-report measures. In addition, only one-third of the sample was diagnosed with ACS at discharge; the remaining participants received diagnoses such as chest pain without a cardiac diagnosis, another symptom/disease process (e.g., hypertensive chronic kidney disease), or another cardiac disease.

Conclusions: Findings suggest that suspected ACS-related PTSD symptoms are best-represented by a 4-factor structure distinguishing between specific (e.g., re-experiencing) and non-specific (dysphoria) symptoms of PTSD that has received support in the broader PTSD literature.

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1. Introduction

Unlike most psychiatric disorders, posttraumatic stress disorder (PTSD) is contingent upon exposure to a traumatic event (American Psychiatric Association, 2013). In recent years, PTSD that develops in response to acute life-threatening medical events, such as acute coronary syndrome (ACS), has received increasing attention as an important public health concern (see Edmondson (2014), for a review). ACS encompasses a variety of conditions in which the blood supply to the heart is suddenly blocked, including acute myocardial infarction and unstable angina (Ruff and Braunwald, 2011), and over 1 million individuals are hospitalized in the United States each year for ACS (Mozaffarian et al., 2015). ACS patients frequently report peritraumatic experiences that are associated with risk for developing PTSD, including intense fear, perceived life threat, helplessness, and a lack of control (Edmondson, 2014; Holbrook et al., 2001). Meta-analytic evidence suggests that PTSD due to ACS is common, with approximately 12% of individuals developing significant PTSD symptoms in response to ACS (Edmondson et al., 2012). Moreover, elevated ACS-related PTSD symptoms have been associated with double the risk of ACS recurrence and all-cause mortality (Edmondson et al., 2012), as well as with lower adherence to recommended health behaviors,

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such as adherence to cardiovascular medications (Kronish et al., 2012).

Although PTSD has often been treated as a homogeneous diagnostic entity, a well-established literature indicates that this disorder is a heterogeneous construct (Forbes et al., 2010; Zoellner et al., 2014). A growing body of factor analytic studies has supported 4- and 5-factor models of PTSD symptoms. The 4-factor dysphoria model has factors for re-experiencing, avoidance, hyperarousal, and dysphoria symptoms, with the dysphoria factor defined by symptoms reflecting non-specific aspects of emotional disorders, such as insomnia and irritability (Simms et al., 2002). The 4-factor numbing model separates avoidance and emotional numbing symptoms into distinct factors, resulting in re-experiencing, avoidance, numbing, and hyperarousal factors (King et al., 1998). The main distinction between these models is whether three hyperarousal items, namely sleep disturbance, irritability/ anger, and difficulty concentrating, are indicators of dysphoria (as in the dysphoria model) or hyperarousal (as in the numbing model). Meta-analytic evidence suggests that both 4-factor models characterize PTSD symptoms well (Yufik and Simms, 2010), and this work influenced the number of symptom clusters included in the revised PTSD diagnosis for the fifth edition of the *Diagnostic and Statistical Manual of Mental Disorders* (*DSM-5*; APA, 2013). Indeed, the *DSM-5* PTSD criteria include a 4-factor model of symptoms that is most similar to the numbing model. A 5-factor dysphoric arousal model has also been developed that separates hyperarousal symptoms into those reflecting dysphoric arousal (i.e., symptoms of agitation and restlessness) and anxious arousal (i.e., fear-based arousal symptoms), resulting in re-experiencing, avoidance, numbing, dysphoric arousal, and anxious arousal factors (Elhai et al., 2011). The dysphoric arousal model has been found to be superior to the two 4-factor models in several samples (e.g., Armour et al., 2013; Harpaz-Rotem et al., 2014; Pietrzak et al., 2012).

Studying the measurement invariance of PTSD symptom structure is important because it can indicate whether model features remain stable as a function of clinically-relevant factors, such as sample characteristics (e.g., age; Sumner et al., 2014) or conditions (endorsement of the subjective fear/helplessness/horror Criterion A2; Armour et al., 2011). In the broader literature, PTSD symptoms have been found to be more common and severe in women than in men (Kessler et al., 1995; Tolin and Foa, 2006), and several studies have examined sex differences in the factor structure of PTSD symptoms (e.g., Armour et al., 2011; Hall et al., 2012; Sumner et al., 2014; Wang et al., 2013). Although there is variability in the degree of support for measurement invariance in the dysphoria, numbing, and dysphoric arousal models of PTSD symptoms across sex, a number of investigations have documented higher item intercepts and/or factor means (suggestive of greater PTSD severity) for female than male participants (Armour et al., 2011; Sumner et al., 2014; Wang et al., 2013; although see Hall et al., 2012, for an exception).

In addition, it is of interest to examine correlates of PTSD symptom dimensions. Indeed, researchers have emphasized the importance of validating distinct PTSD dimensions against functional correlates rather than solely relying on model fit statistics (Elhai and Palmieri, 2011). Accordingly, evidence of differential associations between symptom dimensions of the dysphoric arousal model with neurobiological correlates of PTSD (e.g., serotonergic receptor density and norepinephrine transporter availability in the brain; Pietrzak et al., 2013a, 2013b) suggests that studying PTSD symptom dimensions may help to refine understanding of how underlying factors relate to manifestations of the PTSD phenotype.

Despite extensive research on the dimensional structure of PTSD in veterans (e.g., Harpaz-Rotem et al., 2014; Pietrzak et al., 2012) and nationally representative samples exposed to a variety of traumas (Armour et al., 2013), to date, no study of which we are aware has examined the latent structure of PTSD symptoms that develop in response to ACS. Elucidating the dimensions underlying this disorder can further the understanding of manifestations of PTSD symptoms induced by ACS. Some researchers have hypothesized that PTSD triggered by discrete external traumatic events such as combat exposure and physical assault is distinct from PTSD triggered by acute manifestations of chronic disease due, in part, to differences in the nature of certain PTSD symptoms. For example, the re-experiencing symptoms of individuals with PTSD triggered by an acute presentation of a chronic illness may be focused on enduring threats of recurrence and functional decline as opposed to a discrete past event (Edmondson, 2014). Tests of whether the latent structure of PTSD induced by ACS is similar to that of PTSD that develops in response to other types of traumatic events can help to address whether PTSD due to acute illness best fits within the traditional PTSD framework. Furthermore, delineating how dimensions of ACS-related PTSD symptoms relate to clinically-relevant factors, and demonstrating evidence of differential associations, can refine understanding and improve knowledge of mechanisms of risk of the development of and consequences from PTSD.

In this study, we conducted the first known evaluation of the dimensional structure of PTSD symptoms after suspected ACS using data from the REactions to Acute Care and Hospitalization (REACH) study, an observational cohort study of emergency department (ED) predictors of medical and psychological outcomes after evaluation for ACS. Using confirmatory factor analysis (CFA), we compared the 4-factor dysphoria, the 4-factor numbing, and the 5-factor dysphoric arousal models. In addition, we tested for measurement invariance of the best-fitting model across sex. Furthermore, we examined predictors and correlates of PTSD symptom dimensions after suspected ACS, namely perceived life threat and personal vulnerability in the ED (a risk factor for developing PTSD; Holbrook et al., 2001), and aspirin adherence one month after ACS evaluation (a functional correlate with relevance to cardiovascular health outcomes; Kronish et al., 2012).

2. Methods

2.1. Participants and procedure

The REACH study is an ongoing observational cohort study of patients recruited during evaluation for ACS at the New York-Presbyterian Hospital ED. Patients were included if the treating ED physician indicated they had "probable ACS". Patients were excluded if they had ST elevations on their electrocardiogram, as this triggers a rapid emergency protocol and transfer to the cardiac catheterization laboratory such that enrollment in the ED was not possible. Patients were also excluded from participation if they were deemed unable to comply with the protocol (e.g., due to dementia or substance abuse), were deemed in need of immediate psychiatric intervention, or were unavailable for follow-up (e.g., due to terminal non-cardiovascular illness). In the ED, participants completed measures of their ED experience, including perceived life threat and personal vulnerability in response to the acute cardiac event that brought them to the hospital. Diagnosis at discharge was determined by review of the medical record by a board-certified cardiologist. Approximately one month after ED enrollment, participants completed a follow-up phone interview that assessed PTSD symptoms that developed in response to the "heart problem, ED visit, and hospitalization" that occurred when they enrolled in the study. Adherence to aspirin medication in the past month was also assessed via self-report at this follow-up