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Clarifying the role of pain tolerance in suicidal capability

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ABSTRACT

Joiner's (2005) interpersonal-psychological theory of suicide hypothesizes that painful and provocative events increase pain tolerance. The theory further proposes that increased pain tolerance represents one component of increased suicidal capability. Although initial studies have been consistent with this model, several key aspects remain untested. In 67 undergraduates, we investigated associations among painful and provocative events, nonsuicidal self-injury, acquired capability for suicide, and pain tolerance, threshold, and perceived intensity. Results were highly consistent with the interpersonal-psychological theory: a multiple mediation model specified that pain tolerance – but not other pain variables – accounted for significant variance within the association between painful and provocative events and acquired capability for suicide. These results held even when the pain tolerance item was removed from the suicidal capability questionnaire. Results also supported the interpersonal-psychological theory hypothesis that nonsuicidal self-injury represents an important painful and provocative event that increases suicidal capability. Specifically, participants with a history of nonsuicidal self-injury displayed increased suicidal capability and decreased pain perception. Overall, these results indicate that pain tolerance plays an important and specific role in suicidal capability.

1. Introduction

In 2007, in the United States alone, there were nearly one million suicide attempts, with a suicide completion occurring every 15 min (McIntosh, 2010). Suicidality is a major public health problem and research is desperately needed to gain greater insight into why individuals engage in these behaviors. To this end, Joiner (2005) proposed the interpersonal-psychological theory of suicide. It states that suicide is most likely to occur when an individual has both a high desire for suicide (i.e., perceived burdensomeness and thwarted belongingness; see Joiner, 2005) and a high capability for suicide (i.e., an ability to overcome the basic self-preservation instinct; see Ohman and Mineka, 2001). This theory provides an explanation for why most people who have a high desire for suicide never attempt suicide. It also explains previously unaccounted for patterns such as relatively high suicide rates in physicians (Cornette et al., 2009) and military personnel (Selby et al., 2010). Perhaps most importantly, the interpersonal-psychological theory of suicide has generated new therapeutic targets and strategies (see Joiner and Van Orden, 2008).

There is a growing literature aimed at evaluating the components of this new theory — particularly desire for suicide; however, there is relatively little empirical data on perhaps the most novel component of this theory, capability for suicide (Van Orden et al., 2010). Stringent tests of this theory are needed to advance knowledge about the nature of suicidality and how to prevent such behaviors. In the present study, we provided stringent tests of this theory's hypotheses about the role of pain tolerance in suicidal capability.

The interpersonal-psychological theory of suicide posits that the acquired capability for suicide (ACS) arises from painful and provocative experiences (PPEs; e.g., contact sports, witnessing abuse, getting a tattoo). There are two aspects of ACS: lowered fear of death and increased pain tolerance (Van Orden et al., 2010). Via opponent processes (see Solomon, 1980), PPEs generate habituation to the fear associated with death and the painfulness associated with many methods of suicide; in other words, PPEs increase ACS. Although there are no published longitudinal studies of this hypothesis and few studies have used methods other than self-report, initial tests are consistent with these predictions. Using questionnaires developed to assess a history of PPEs and ACS, Van Orden et al. (2008) found that these two constructs were significantly correlated ($r = 0.28$) in a sample of individuals with a history of suicide attempts. Bender et al. (2011) found a similar correlation in a clinical sample ($r = 0.35$) and an even higher correlation in an undergraduate sample ($r = 0.42$).

The role of pain tolerance in the link between PPEs and ACS has received even less attention. Several studies have found that pain tolerance is associated with various aspects of suicidality (e.g., Orbach et al., 1996); however, only one published study has examined the association between pain tolerance and PPEs and ACS. Bender et al. (2011) found that pain tolerance was moderately correlated with both PPEs and ACS ($rs = 0.40$ and 0.42). Although this study was not

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longitudinal, its results are consistent with the interpersonal-psychological theory hypothesis that PPEs increase ACS partly by increasing pain tolerance (see Fig. 1). Nonetheless, these results are also consistent with a plausible alternative model (see Fig. 2). In this model, pain tolerance is not a crucial link between PPEs and ACS; rather, it is coincidentally and independently associated with PPEs and ACS. These independent associations may occur because natural pain tolerance may be normally distributed in the population. Individuals with a naturally higher pain tolerance may be: (a) naturally more capable of engaging suicidality; and (b) more likely to engage in PPEs because they find them less aversive. The role of pain tolerance in the PPE–ACS association is among the most novel and important aspects of the interpersonal-psychological theory of suicide. Accordingly, it is crucial that the alternative model be ruled out.

The interpersonal-psychological theory of suicide also specifies that pain tolerance – but not other pain variables such as threshold and perceived intensity – is important to the PPE–ACS relationship (Van Orden et al., 2010). Given extensive evidence that suicidality is correlated with several non-tolerance pain variables (e.g., Orbach et al., 1996; Kemperman et al., 1997; Matsumoto et al., 2008), there is reason to doubt a specific role for pain tolerance. The theory specifies a role for pain tolerance because it posits that one of the most important proximate factors of suicide may be the "cognitive appraisal that the pain involved in the chosen method of suicide is tolerable" (Van Orden et al., 2010, p. 586). Although Bender et al. (2011) found that PPEs and ACS are correlated with pain tolerance, no published study has examined the association between these constructs and other pain measures such as pain threshold or perceived intensity. A stringent test of this hypothesis is necessary to provide discriminant validity for this fundamental aspect of the interpersonal-psychology theory of suicide.

We employed a multiple mediation model (see Preacher and Hayes, 2008) to test the specific role of pain tolerance in the PPE–ACS relationship. Multiple mediation models simultaneously test the ability of multiple variables to account for variance in a given association between two other variables (e.g., PPE–ACS). Importantly, this technique controls for collinearity among potential mediators, meaning that all significant effects are unique effects (Preacher and Hayes, 2008). Because the present study did not include longitudinal data, these analyses cannot be employed to infer causality; however, they may still be utilized to examine the degree to which pain variables account for the PPE–ACS association. Accordingly, this technique allowed for a powerful and efficient test of hypotheses about the relative contributions of multiple pain variables to the PPE–ACS association. We further stringently tested these hypotheses by repeating analyses with a version of the ACS scale that does not include the potentially confounding item "I can tolerate a lot more pain than most people."

In addition to examining associations with a general index of PPEs (cf. Van Orden et al., 2008; Bender et al., 2011), we investigated associations with a specific PPE, nonsuicidal self-injury (NSSI; e.g., intentionally cutting or burning the skin without suicidal intent, see Nock, 2010). This allowed for a test of the hypothesis that NSSI is an important PPE that increases ACS (Joiner, 2005). Indeed, NSSI is associated with both increased pain endurance (Hooley et al., 2010) and suicidal self-injury (Andover and Gibb, 2010); nevertheless, there is no direct empirical evidence that NSSI is specifically associated with ACS.

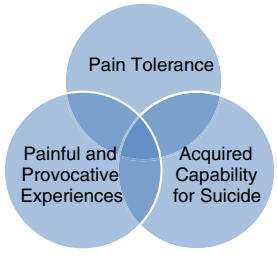

Fig. 1. Interpersonal-psychological theory's model for the role of pain tolerance in PPE–ACS.

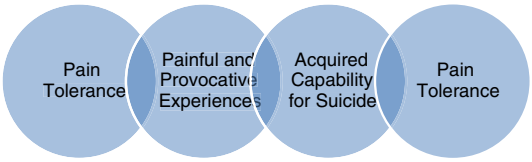

Fig. 2. Alternative model for the role of pain tolerance in PPE–ACS.

According to the interpersonal-psychological theory of suicide, suicidal capability is a necessary but insufficient factor for suicide (i.e., suicidal desire must also be present). This means that the vast majority of individuals with a high capability for suicide should never have a desire for suicide or engage in suicidal behaviors (Joiner, 2005; Van Orden et al., 2010). For example, Van Orden et al. (2008) found that a measure of ACS did not correlate with measures of depression or suicidal ideation. Accordingly, the PPE–ACS association should exist in a nonclinical population; moreover, this relationship may be even stronger and more cleanly observed in a nonclinical population because it is less tainted by factors associated with desire for suicide (e.g., low distress tolerance; Anestis et al., 2011a,b). As such, we utilized a nonclinical population in the present study.

2. Methods

2.1. Subjects

Participants were 67 young adults: 47 females, 20 males; 80.60% European American, 8.90% Asian American, 7.46% African American, and 2.99% Hispanic American. Ages ranged from 18 to 29 ($M = 19.25$, $SD = 2.07$). We recruited participants from two sources: (1) introductory psychology classes that included a research participation option ($n = 41$); and (2) campus-wide email advertisements that offered payment of $20 for participation in the study ($n = 26$). These latter participants were recruited from email advertisements sent to individuals based on their NSSI scores on a screening questionnaire that was administered as part of a separate study during a summer college orientation program. Of these participants, 10 were controls and 16 (11 females) had a history of "severe" NSSI (i.e., cutting, burning, or scraping). Many studies include a wider variety of behaviors as NSSI (e.g., skin-picking, scab-picking, lip-biting). In an effort to accurately reflect clinically-relevant NSSI behaviors, we elected to include only intense behaviors that are associated with at least a moderate degree of tissue damage. Descriptive statistics for NSSI are presented elsewhere (Franklin et al., 2010).

Analyses indicated that ethnicity and age were not significantly associated with PPEs, ACS, or pain variables. Inconsistent with previous findings (e.g., Klatzkin et al., 2010), analyses also indicated that, compared to females, males did not have significantly higher pain thresholds ($d = 0.26$), higher pain tolerances ($d = 0.25$), or lower pain intensity at threshold ($d = 0.03$) or tolerance points ($d = 0.05$). It is likely that this lack of gender differences is due in part to (a) colder water than that employed in most cold pressor studies (see below), and (b) the abnormal pain perception of females with a history of NSSI (see below). Consistent with previous findings (e.g., Van Orden et al., 2008), males displayed significantly higher levels of PPEs ($t[65] = 2.99$, $P < 0.01$, $d = 0.81$) and ACS ($t[65] = 1.85$, $P < 0.05$, $d = 0.50$). Because of the potential impact of NSSI history and gender on results, these two variables were used as covariates during multiple mediation analyses of the PPE–ACS association. Participants completed informed consent forms at the beginning of the study. All materials, measures, methods, and procedures were approved by the Institutional Review Board of the University of North Carolina at Chapel Hill.

2.2. Procedures

The present investigation was conducted as part of a larger study described elsewhere (Franklin et al., 2010). This larger study was focused primarily on the functions of NSSI; the present investigation employs the same sample but tests a distinct, suicide-relevant hypothesis. Relevant to the present investigation, participants first filled out questionnaires assessing PPEs and ACS. During the experimental portion of the study, participants completed a speech task (see Franklin et al., 2010), which was immediately followed by a painful task (i.e., the cold pressor task). Because stress induced by the speech task could conceivably influence results, in mediational analyses