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Mechanisms of Action Contributing to Reductions in Suicide Attempts Following Brief Cognitive Behavioral Therapy for Military Personnel: A Test of the Interpersonal-Psychological Theory of Suicide

Craig J. Bryan, David S. Wood, Alexis May, Alan L. Peterson,
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Brief cognitive behavioral therapy (BCBT) is associated with significant reductions in suicide attempts among military personnel. However, the underlying mechanisms of action contributing to reductions in suicide attempts in effective psychological treatments remain largely unknown. The present study conducted a secondary analysis of a randomized controlled trial of BCBT versus treatment as usual (TAU) to examine the mechanisms of action hypothesized by the interpersonal-psychological theory of suicide (IPT): perceived burdensomeness, thwarted belongingness, and fearlessness about death. In a sample of 152 active duty U.S. Army personnel with recent suicide ideation or attempts, there were significantly fewer suicide attempts in BCBT, but there were no differences between treatment groups from baseline to 6 months postbaseline on any of the 3 IPT constructs or their interactions. Tests of the moderated mediation failed to support an indirect effect for the IPT model, regardless of which IPT variables were specified as mediators or moderators. Results suggest that the IPT's hypothesized mechanisms of action do not account for reductions in suicide attempts in BCBT. Implications for clinical practice and research are discussed.

Keywords brief cognitive behavioral therapy, interpersonal-psychological theory of suicide, suicide

The number of suicides by military personnel has steadily increased since 2004, and has remained high despite a relative decline

during 2013 (Smolensky et al., 2014). Approximately 22% of military personnel who die by suicide accessed outpatient

behavioral health services within the preceding month, suggesting that up to one-quarter of suicides could be prevented with effective mental health treatment. In response to these trends, the Department of Defense (DOD) and Veterans Administration (VA) increased efforts to identify treatments that can reduce suicidal behaviors in this population. Results of a recently completed clinical trial of a 12-session brief cognitive behavioral therapy (BCBT) protocol showed that the treatment reduced suicide attempts by 60% among active duty soldiers reporting current suicide ideation and/or a recent suicide attempt as compared to soldiers receiving treatment as usual (Rudd et al., 2015). Between-group differences were seen as early as 3 months following the start of treatment, indicating the treatment has rapid efficacy. Results also aligned with previous findings obtained in a non-military sample that used a similar treatment protocol (Brown et al., 2005), which suggests the treatment approach is effective across settings and populations.

BCBT was also associated with significant reductions in suicide ideation, depression, hopelessness, anxiety, and post-traumatic stress symptoms, but the magnitude of these reductions were comparable to those seen in TAU. Thus, despite BCBT's superior outcomes with respect to suicide attempts, there were little to no differences between BCBT and TAU with regards to suicide ideation, depression, hopelessness, anxiety, or posttraumatic stress symptoms, suggesting BCBT's effect on suicide attempts is due to mechanisms other than reducing psychological symptoms. Identifying mechanisms of change in BCBT is critical for understanding *why* and *how* BCBT reduces suicidal behavior among military personnel, and would serve as an important step towards isolating the active components of BCBT. This, in turn, could lead to the development of increasingly potent interventions.

Recent empirical evidence suggests that one likely mechanism of action is BCBT's effect on the relative balance between the patient's desire to live and desire to die, such that BCBT orients suicidal patients away from death and towards life (Bryan, Rudd, Peterson, Young-McCaughan, & Wertenberger, 2016). Beyond shifting the balance of suicidal ambivalence, however, additional mechanisms of action may underlie BCBT's effect on reduced suicidal behaviors. One conceptual model that has guided a growing number of studies aimed at understanding and preventing suicidal behavior is the interpersonal-psychological theory of suicide (IPT; Joiner, 2007). According to the IPT, suicidal behavior occurs as result of the intersection of suicidal desire (i.e., wanting to die by suicide) and suicidal capability (i.e., being able to inflict lethal self-injury). Suicidal desire entails the combination of perceived burdensomeness (i.e., the belief that one is a liability to others) and thwarted belongingness (i.e., the perception that one does not belong or fit in with a social group and/or is unimportant to others), whereas suicidal capability entails the combination of fearlessness about death and heightened pain tolerance (Joiner, 2007; Van Orden et al., 2010). The considerable empirical evidence supporting the correlation of these three variables with suicidal thoughts and behaviors in clinical and nonclinical settings (Chu, Buchman-Schmitt, Hom, Stanley, & Joiner, 2016; Davis, Witte, & Weathers, 2014; Ma, Batterham, Calcar, & Han, 2016; Miller, Esposito-Smythers, & Leichtweis, 2015; Nadorff, Anestis, Nazem, Harris, & Winer, 2014; Van Orden, Witte, Gordon, Bender, & Joiner Jr, 2008), including military and veteran samples (Anestis, Khazem, Mohn, & Green, 2015; Bryan & Anestis, 2011; Bryan, Clemans, & Hernandez, 2012; Bryan, Morrow, Anestis, & Joiner, 2010; Monteith, Menefee, Pettit, Leopoulos, & Vincent, 2013; Silva et al., 2016),

has led researchers and clinicians to hypothesize that perceived burdensomeness, thwarted belongingness, and capability for suicide serve as central mechanisms of change in effective treatments for suicidal individuals (Joiner, Van Orden, Witte, & Rudd, 2009; Silva et al., 2016).

If true, the reductions in suicide attempts observed among soldiers who receive BCBT should be attributable to reductions in one or more of these three constructs, all of which are targeted in BCBT (Rudd et al., 2015). In the first phase of BCBT, for instance, emotion regulation skills training is emphasized to reduce the patient's tendency to act rashly in response to uncomfortable or negative emotional states. Previous research suggests that emotion dysregulation, especially the tendency to act rashly to avoid or escape from uncomfortable emotional states, is correlated with fearlessness about death whereas perceptions about one's ability to tolerate negative emotional states is correlated with perceived burdensomeness, thwarted belongingness, and pain tolerance (Anestis, Bagge, Tull, & Joiner, 2011; Anestis & Joiner, 2011). Crisis response planning and lethal means counseling, also emphasized during the first phase of BCBT, may additionally target suicidal capability by reducing or restricting access to contextual or practical contributors to suicidal capability, such as easy access to potential methods for suicide (Klonsky & May, 2015). In the second phase of BCBT, perceived burdensomeness and thwarted belonging are further targeted via cognitive restructuring techniques and activity planning. To date, however, no studies have explicitly tested the IPT constructs as potential mediators of positive treatment effects in BCBT or any other empirically-supported treatment for suicide risk.

In light of this knowledge gap, the primary aim of the present study was to test the IPT's primary constructs as potential

mediators of BCBT's effects on reduced suicide attempts among active duty military personnel. To achieve this aim, we conducted a secondary analysis of a randomized clinical trial testing the effectiveness of BCBT as compared to treatment as usual (TAU) for the reduction of suicide attempts in a sample of active duty soldiers reporting recent suicidal thoughts and behaviors. We specifically hypothesized that the three-way interaction of perceived burdensomeness, thwarted belongingness, and fearlessness about death would statistically mediate the effect of treatment group on follow-up suicide attempts.

METHOD

Participants and Procedures

The present study entailed a secondary analysis of a randomized clinical trial testing the effectiveness of BCBT ($n = 76$) as compared to treatment as usual ($n = 76$) for the treatment of acutely suicidal active duty U.S. Army personnel. A full description of the sample, procedures, and treatments has been published elsewhere along with a CONSORT chart (Rudd et al., 2015). In summary, participants were 152 active duty U.S. Army personnel (87.5% male) who were referred for treatment at Fort Carson, CO, with suicide ideation during the past week and/or a suicide attempt during the past month. Participants ranged from 19 to 44 years in age ($M = 27.4$, $SD = 6.2$), and self-identified race was 72.4% Caucasian, 13.2% African American, 4.6% Native American, 2.0% Asian, 2.0% Pacific Islander, and 7.9% "other." Hispanic ethnicity was assessed separately and endorsed by 22.4% of participants. Participants had a mean of 5.6 years of military service ($SD = 4.5$, range: 0–25 years) and had deployed a mean of 1.6 times ($SD = 1.4$, range: 0–8 deployments). At baseline, 58 (38.2%) had a lifetime

history of two or more suicide attempts, 59 (38.8%) had a history of one suicide attempt, and 35 (23.0%) had no previous suicide attempts. There were no baseline differences between the two treatment groups (Rudd et al., 2015).

Soldiers were referred by outpatient military mental health professionals and upon discharge from inpatient psychiatric treatment from January 2011 to September 2012, at which point they were evaluated by trained research staff to determine eligibility. Inclusion criteria included suicide ideation during the past week as determined by a score of 5 or higher on the Beck Scale for Suicide Ideation (Beck & Steer, 1991) and/or a suicide attempt during the past month as determined by the Suicide Attempt Self-Injury Interview (Linehan, Comtois, Brown, Heard, & Wagner, 2006), described below. Exclusion criteria were limited to the inability to complete informed consent process due to active psychosis, mania, intoxication, or impaired mental status. Eligible participants were randomized to either BCBT or TAU using a computerized randomization algorithm. TAU included all of the existing mental health services available from the military health care system, to include individual therapy, group therapy, psychotropic medication, family counseling, and substance abuse counseling. In addition to TAU, participants randomized to BCBT were scheduled for 12 individual BCBT sessions at a pace of once or twice per week. BCBT was conducted by trained research therapists who were monitored and participated in weekly supervision for fidelity. Suicide attempts during the 2-year follow-up period were assessed by a trained evaluator who was blind to treatment condition. Self-report measures used in the present study were assessed at 3 and 6 months post-baseline by the blinded evaluator. The study was reviewed and approved by the Institutional Review Boards at Madigan Army Medical Center, the University of

Texas Health Science Center at San Antonio, and the University of Utah.

Instruments

Suicide attempt during the 2-year follow-up period was assessed with the Suicide Attempt Self-Injury Interview (SASII; Linehan, Comtois, Brown et al., 2006), a structured clinician-administered interview that assesses several features of intentional self-directed violence (e.g., suicidal intent, method, medical lethality, preparatory behaviors). In the present study, suicide attempt was defined as behavior that is self-directed and deliberately results in injury or the potential for injury to oneself for which there is evidence of suicidal intent (Crosby, Ortega, & Melanson, 2011).

Perceived burdensomeness (PB) was assessed with the 12-item version of the Interpersonal Needs Questionnaire (INQ; Van Orden, Cukrowicz, Witte, & Joiner Jr, 2012). The INQ-12 includes six items that assess the intensity of perceived burdensomeness on a scale ranging from 1 (*not at all true for me*) to 7 (*very true for me*). Items are summed such that higher scores indicate more intense perceptions of burdensomeness. Internal consistency estimates at the three time points in the present study were 0.90, 0.93, and 0.91, respectively.

Thwarted belongingness (TB) was assessed with the INQ-12, of which six items assess the intensity of thwarted belongingness using the same scaling as the PB items described above (Van Orden et al., 2012). Items are summed such that higher scale scores indicate more intense perceptions of social disconnectedness and lack of belonging. Internal consistency estimates at the three time points in the present study were 0.82, 0.87, and 0.80, respectively.

Fearlessness about death (FAD) was assessed with the 7-item Acquired

Capability for Suicide Fearlessness About Death Scale (Ribeiro et al., 2014). The scale's items are rated on a scale from 0 (*not at all like me*) to 4 (*very much like me*), with higher scores indicating stronger self-perceptions of fearlessness. Internal consistency estimates at the three time points in the present study were 0.71, 0.77, and 0.76, respectively.

Statistical Analysis

To examine treatment differences over time, we used longitudinal mixed-effects models with random effects, which allows for the estimation of changes over time despite missing data, consistent with the intent-to-treat approach. To identify and test differences in change trajectories for each construct over time, the main effects and interactions of treatment group and time (i.e., baseline, 3 months, 6 months) were selected as predictors, and PB, TB, and FAD scores were selected as separate outcome variables. To test the interpersonal-psychological theory as a potential mediator of treatment effects, we constructed and tested a series of moderated mediation models. The interpersonal-psychological theory hypothesizes that suicidal behavior occurs as the outcome of the three-way interaction between PB,

TB, and FAD. As such, we tested the indirect effects of the three-way interaction of these three constructs using scores from the 3- and 6-month follow-up assessments and the moderated-moderated mediation model described by Hayes (2016), with 95% bias-accelerated confidence intervals computed using 5,000 resamples. The moderated-moderated mediation model is depicted graphically in Figure 1, and allows for the testing of mediation effects for a variable that is moderated by two other variables, consistent with the IPT model. In order to ensure that results were not specific to the specification of a particular variable as the mediator, we “switched the places” of each IPT variable such that all three variables were specified as the mediator. As will be discussed below, this did not change our results.

RESULTS

Mean PB, TB, and FAD scores at each time point are presented in Table 1 for both treatment conditions. As can be seen, mean PB scores significantly decreased over time in both BCBT and TAU, mean TB scores significantly decreased over time in BCBT but did not change in TAU, and mean FAD scores did not change over time

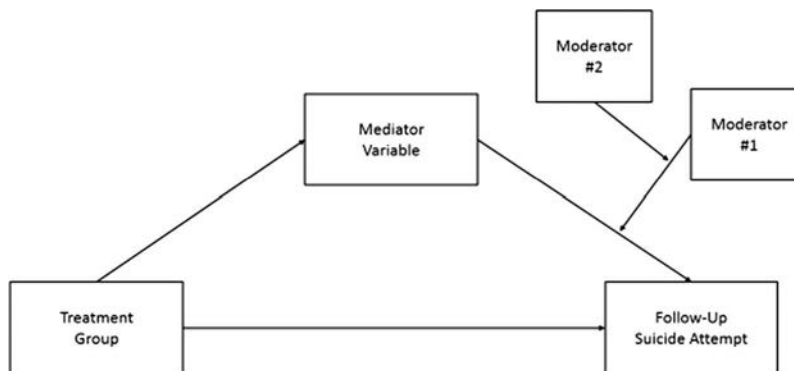


FIGURE 1. *The moderated mediation model.*

TABLE 1. Mean Perceived Burdensomeness, Thwarted Belongingness, and Fearlessness About Death Scores Over Time in a Sample of 152 Suicidal Active Duty Soldiers, by Treatment Group

| Time | Perceived burdensomeness <i>M</i> (SD) | | Thwarted belongingness <i>M</i> (SD) | | Fearlessness about death <i>M</i> (SD) | |
|-------------------|--|------------|--------------------------------------|------------|--|------------|
| | TAU | BCBT | TAU | BCBT | TAU | BCBT |
| Baseline | 13.0 (7.7) | 13.7 (7.9) | 19.0 (8.0) | 19.7 (7.7) | 19.4 (5.7) | 18.4 (5.6) |
| 3 months | 8.5 (6.8) | 8.4 (6.0) | 17.5 (8.3) | 15.5 (7.8) | 19.3 (6.4) | 18.7 (5.4) |
| 6 months | 10.1 (7.2) | 9.7 (6.7) | 18.4 (8.6) | 16.7 (7.4) | 19.7 (5.7) | 19.4 (5.9) |
| F_{time} | 7.46 | 13.25 | 0.26 | 5.54 | 0.54 | 0.97 |
| P | .001 | <.001 | .774 | .006 | .583 | .383 |

in either BCBT or TAU. The treatment-by-time interactions were not statistically significant for any of the three variables, suggesting that change slopes across treatments did not differ from each other: PB ($F(2,141) = 0.50, p = .606$), TB ($F(2,141) = 1.54, p = .218$), and FAD ($F(2,141) = 0.17, p = .847$).

Effects of Treatment on the Three-Way Interaction of Perceived Burdensomeness, Thwarted Belongingness, and Fearlessness About Death

Because the IPT hypothesizes that it is the combination of these three variables that confers increased risk for suicidal behavior, we additionally tested differences in the three-way interaction of PB, TB, and FAD over time. The value of the three-way interaction significantly declined over time in BCBT ($F(2,52) = 5.87, p = .005$) but not TAU ($F(2,42) = 2.73, p = .077$), but the change slope did not significantly differ between the two treatments ($F(2,94) = 0.38, p = .685$).

Testing the Moderated-Moderated Mediation Hypothesis for the IPT

As previously reported (Rudd et al., 2015), participants in BCBT were significantly less likely to make a suicide attempt during the 2-year follow-up (OR = 0.39 [0.16, 0.95], $p = .038$). Treatment group

was not correlated with PB, TB, or FAD scores or their interactions at any time point (see Table 2), suggesting that IPT constructs did not differ across treatment groups over time. Follow-up suicide attempts were largely uncorrelated with PB, TB, or FAD scores (or their interactions) over time, suggesting that IPT constructs minimally differed between those who attempted suicide during follow-up and those who did not. Results of the moderated-moderated mediation analyses yielded no statistically significant indirect effects of treatment group on follow-up suicide attempts when using both 3- and 6-month follow-up data, regardless of how the variables were organized as a mediator or a moderator (see Table 3).

DISCUSSION

Despite evidence supporting the effectiveness of BCBT for the reduction of suicide attempts among military personnel (Rudd et al., 2015), the specific mechanisms that underlie this effect remain little understood. The interpersonal-psychological theory posits three key mechanisms of action: perceived burdensomeness, thwarted belongingness, and the capability for suicide, the latter of which entails heightened fearlessness about death and pain tolerance (Joiner, 2007; Van Orden et al., 2008; Van Orden et al., 2010).

TABLE 2. Zero-Order Correlations of Treatment Group and Follow-Up Suicide Attempt With Perceived Burdensomeness (PB), Thwarted Belongingness (TB), Fearlessness About Death (FAD), and Their Interactions Among Active Duty U.S. Army Soldiers Treated for Suicide Risk at Baseline and 3-Month and 6-Month Follow-ups

| | Treatment group ^a | | | Follow-up suicide attempt ^b | | |
|---------------|------------------------------|---------|---------|--|---------|---------|
| | Baseline | 3 Month | 6 Month | Baseline | 3 Month | 6 Month |
| PB | 0.04 | -0.02 | -0.03 | -0.04 | -0.11 | 0.10 |
| TB | 0.04 | -0.14 | -0.11 | -0.17* | -0.09 | 0.19* |
| FAD | -0.09 | -0.05 | -0.03 | -0.12 | -0.16 | -0.05 |
| PB × TB | 0.05 | -0.05 | -0.11 | -0.11 | -0.13 | 0.11 |
| PB × FAD | -0.01 | -0.07 | -0.07 | -0.06 | -0.10 | 0.13 |
| TB × FAD | -0.04 | -0.15 | -0.13 | -0.18* | -0.11 | 0.17 |
| PB × TB × FAD | 0.01 | -0.09 | -0.14 | -0.11 | -0.12 | 0.12 |

Note. * $p < .05$; ^aTreatment group coded as 0 = treatment as usual and 1 = brief cognitive behavioral therapy; ^bfollow-up suicide attempt coded as 0 = no attempt and 1 = suicide attempt.

Although cross-sectional and prospective studies in military and non-military samples supports the association of these variables with suicidal thoughts and behaviors, to our knowledge, this is the first study to test the IPT as a possible explanatory model for the reduction of suicidal behaviors in a treatment study. Consistent with conceptual work, empirical findings, and recommendations of IPT researchers, we hypothesized that the three-way interaction of perceived burdensomeness, thwarted belongingness, and fearlessness about death would mediate the effect of treatment group (BCBT or TAU) on follow-up suicide attempts in a sample of active duty soldiers receiving outpatient treatment for heightened suicide risk. Results of the present study did not support this mediation effect, however.

Across both BCBT and TAU, mean PB scores declined to an equivalent degree whereas FAD scores did not change. In contrast, mean TB scores significantly declined in BCBT but not TAU. The degree of this between-groups difference was not large, however. Consequently, the overall change in TB scores over time did not differ between treatments. In light of these trends, it is not surprising that although the value

of the three-way interaction of PB, TB, and FAD significantly declined in BCBT but not TAU, the overall difference between treatments was negligible. We additionally found that none of the three IPT variables (PB, TB, and FAD) or any of their interaction terms were related to suicide attempts during the 2-year follow-up period. From a mediation perspective, these results indicate that neither the *a* path (i.e., independent variable to mediator) nor the *b* path (i.e., mediator to outcome variable) were statistically significant. Critically, this absence of effect remained regardless of how the variables were specified as mediators or moderators, which mitigates the possibility that null findings are related to differences among mediation versus moderation effects. Taken together, these results suggest that the IPT is unlikely to explain a meaningful degree of BCBT's effects on reduced suicidal behavior among active duty soldiers.

Though the present findings appear to diverge from previous studies supporting the IPT's utility as a conceptual model for understanding and predicting suicidal behavior (Anestis et al., 2015; Bryan et al., 2010; Chu et al., 2016; Ma et al., 2016; Miller et al., 2015; Monteith et al.,

TABLE 3. Conditional Indirect Effects of Treatment Group on Follow-up Suicide Attempts at High (One Standard Deviation Above the Mean), Mean, and Low (One Standard Deviation Below the Mean) Values of Thwarted Belongingness (TB), Perceived Burdensomeness (PB), and Fearlessness About Death (FAD)

| Mediator | Moderator #1 | Moderator #2 | 3 Months | | 6 Months | |
|----------|--------------------|---------------------|----------|---------------|----------|---------------|
| | | | B | [95% CI] | B | [95% CI] |
| TB | PB _{Low} | FAD _{Low} | -0.00 | [-0.63, 0.65] | -0.06 | [-2.28, 0.43] |
| | PB _{Low} | FAD _{Mean} | -0.10 | [-0.99, 0.55] | -0.24 | [-1.97, 1.09] |
| | PB _{Low} | FAD _{High} | -0.21 | [-2.26, 0.67] | -0.43 | [-3.97, 1.66] |
| | PB _{Mean} | FAD _{Low} | 0.42 | [-0.20, 3.46] | 0.00 | [-0.96, 0.61] |
| | PB _{Mean} | FAD _{Mean} | 0.17 | [-0.32, 1.17] | -0.04 | [-0.94, 0.37] |
| | PB _{Mean} | FAD _{High} | -0.07 | [-3.33, 0.30] | -0.08 | [-1.90, 0.59] |
| | PB _{High} | FAD _{Low} | 0.89 | [-0.63, 6.36] | 0.05 | [-0.65, 1.67] |
| | PB _{High} | FAD _{Mean} | 0.49 | [-1.39, 2.70] | 0.16 | [-0.65, 1.86] |
| | PB _{High} | FAD _{High} | 0.09 | [-2.11, 3.52] | 0.26 | [-1.25, 3.04] |
| PB | TB _{Low} | FAD _{Low} | -0.08 | [-3.50, 1.49] | 0.00 | [-0.83, 0.96] |
| | TB _{Low} | FAD _{Mean} | -0.05 | [-1.70, 1.10] | -0.09 | [-1.83, 1.65] |
| | TB _{Low} | FAD _{High} | -0.03 | [-1.93, 0.94] | -0.17 | [-3.29, 3.35] |
| | TB _{Mean} | FAD _{Low} | -0.01 | [-1.06, 0.81] | 0.02 | [-0.37, 0.85] |
| | TB _{Mean} | FAD _{Mean} | 0.00 | [-0.55, 0.54] | -0.04 | [-0.88, 0.54] |
| | TB _{Mean} | FAD _{High} | 0.00 | [-1.30, 1.73] | -0.09 | [-1.72, 1.34] |
| | TB _{High} | FAD _{Low} | 0.07 | [-0.86, 1.71] | 0.03 | [-0.56, 1.10] |
| | TB _{High} | FAD _{Mean} | 0.04 | [-1.76, 1.80] | 0.02 | [-0.51, 0.87] |
| | TB _{High} | FAD _{High} | 0.02 | [-1.79, 5.39] | 0.00 | [-0.76, 1.32] |
| FAD | TB _{Low} | PB _{Low} | 0.08 | [-0.40, 1.45] | 0.08 | [-1.82, 2.07] |
| | TB _{Low} | PB _{Mean} | 0.13 | [-0.62, 2.05] | 0.00 | [-0.77, 1.06] |
| | TB _{Low} | PB _{High} | 0.19 | [-1.09, 4.70] | -0.09 | [-2.89, 1.45] |
| | TB _{Mean} | PB _{Low} | 0.04 | [-0.31, 0.97] | 0.04 | [-0.65, 1.19] |
| | TB _{Mean} | PB _{Mean} | 0.04 | [-0.51, 0.98] | -0.01 | [-0.61, 0.41] |
| | TB _{Mean} | PB _{High} | 0.05 | [-1.28, 2.36] | -0.06 | [-1.74, 0.78] |
| | TB _{High} | PB _{Low} | 0.01 | [-1.08, 1.04] | -0.01 | [-1.51, 0.69] |
| | TB _{High} | PB _{Mean} | -0.04 | [-1.24, 0.36] | -0.02 | [-0.93, 0.34] |
| | TB _{High} | PB _{High} | -0.10 | [-2.23, 2.23] | 0.03 | [-1.12, 0.36] |

2013; Silva et al., 2016; Van Orden et al., 2008), the present study’s design differed in a number of important ways that allowed us to test the hypotheses of the IPT using methods and approaches that previous studies could not use. First, the preponderance of IPT research has largely examined the associations of PB, TB, and FAD with suicidal thoughts and *previous* suicide attempts as opposed to examining

their prospective association with suicidal behaviors (e.g., Anestis et al., 2015; Bryan, 2011; Bryan et al., 2012; Silva et al., 2016). As has been noted and discussed elsewhere (May & Klonsky, 2016), the correlates of suicidal thoughts do not necessarily correlate with suicidal behavior. Furthermore, cross-sectional studies that investigate the association of IPT variables with *past* suicide attempts rather than future suicide

attempts could confound hypothesized directional effects (Anestis et al., 2015; Bryan et al., 2012; Silva et al., 2016). Recent evidence indicates, for example, that elevated fearlessness about death likely precedes exposure to provocative life experiences such as combat (Bryan, Sinclair, & Heron, 2016), rather than the reverse sequence that has been assumed by many IPT researchers based on cross-sectional study designs (Selby et al., 2010; Van Orden et al., 2010).

The present findings mirror a pattern observed in several previous clinical trials. Specifically, BCBT and other treatments that significantly reduce suicide attempt rates (e.g., dialectical behavior therapy, cognitive therapy for suicide prevention) show little to no superiority relative to comparison treatments with respect to self-reported psychological symptoms such as depression, hopelessness, anxiety, and even suicide ideation (Brown et al., 2005; Gysin-Maillart, Schwab, Soravia, Megert, & Michel, 2016; Linehan, Comtois, Murray et al., 2006; Rudd et al., 2015). Because IPT constructs generally show stronger correlations with suicidal thoughts than suicidal behavior (e.g., Klonsky & May, 2015), the present results, though unexpected, converge with findings from multiple clinical trials. This suggests that, across suicide-focused treatments, commonly assumed treatment targets such as a symptom relief or fewer suicidal thoughts, do not appear to operate as actual mechanisms of change resulting in reduced suicidal behavior post-treatment.

Another potential explanation for the departure of our findings from the existing IPT literature may be related to several characteristics of the current study. First, the present study enrolled a fairly homogeneous sample of active duty military personnel with respect to high suicide risk: all endorsed active suicidal ideation during the past week and/or had made a suicide attempt in the past month. This contrasts

with previous studies examining the IPT, which have enrolled samples with much greater variability in suicide risk, to include participants with no active suicidal thoughts or recent suicide attempts. The IPT may therefore be useful for distinguishing between higher and lower risk subgroups along the full spectrum of suicide risk, but may be less able to differentiate among more nuanced shades of risk among subgroups at the high-risk end of the spectrum. Second, the present study employed a longitudinal design to track outcomes associated with two distinct approaches to psychological treatment. Previous studies have considered IPT constructs as treatment outcomes with suicidal patients (Joiner & Van Orden, 2008; Joiner et al., 2009), but to our knowledge, this is the first study to consider the IPT constructs as potential *mechanisms* of reduced risk for suicidal behavior in psychological treatments for high-risk patients.

Yet another possibility is that the methods used for assessing IPT constructs do not adequately assess hope, which has been proposed as an important, though understudied, part of the theory. Specifically, the IPT argues that it is hopelessness *about* thwarted belongingness and perceived burdensomeness, or the combination of hopelessness with these two variables that facilitates the emergence of active suicide ideation and, eventually, suicidal behavior (Joiner, 2005; Van Orden et al., 2010). Consistent with this, Klonsky and May (2015) have reported that the presence of hope offsets the effects of emotional pain on suicide ideation. Further research is needed to determine how hope and hopelessness might function as mechanisms of action within BCBT and other treatments.

A final possibility is that BCBT was developed based on a different conceptual model of suicide, namely the fluid vulnerability theory (FVT) and the notion of

the *suicidal mode*, which serves as the cognitive behavioral framework for understanding and targeting the emergence of suicidal thoughts and behaviors (Rudd, 2006). According to the FVT, suicidal behaviors emerge as the result of dynamic interactions among several domains of risk: triggers (e.g., life stressors), cognition (i.e., beliefs and self-statements), behavior (i.e., actions and coping strategies), physiology (i.e., somatic experiences and biological factors), and emotion (i.e., affective states). The constructs articulated by the IPT—perceived burdensomeness, thwarted belongingness, and fearlessness about death—align most directly with the FVT's cognition domain. As such, the IPT and FVT are best understood as nested models rather than mutually exclusive or competing models (Wolfe-Clark & Bryan, 2016). The emphasis of existing IPT measures on the cognitive domain of risk may therefore be insufficient for understanding treatment mechanisms. For example, targeting emotion regulation and problem solving skills may be especially important for reducing suicidal and self-injurious behaviors (Gratz & Gunderson, 2006; Linehan et al., 2015). Self-report measures of IPT variables (or other constructs within the cognition domain) may not be sufficient to capture change in these constructs.

From a clinical perspective, the present results suggest that CBT's effects on suicidal behavior may be related to factors other than self-reported indices of emotional distress and psychological symptoms. For example, others have posited that mechanisms such as emotion regulation, problem solving, and implicit beliefs are central to treatment efficacy (Bryan, 2016; Bryan, Grove, & Kimbrel, 2017; Rudd, 2006; Rudd, Joiner, & Rajab, 2004). Supporting this perspective are studies showing that computerized cognitive bias tasks (e.g., the suicide implicit association task and the suicide Stroop test), psychophysiological and neurobiological measures of autonomic

reactivity, and objective measures of decision-making style are more strongly associated with suicidal behavior than self-report measures of suicide risk factors (Cha, Najmi, Park, Finn, & Nock, 2010; Davidson, Putnam, & Larson, 2000; Nock & Banaji, 2007; Nock et al., 2010; Zlotnick, Donaldson, Spirito, & Pearlstein, 1997). Self-report methodology may therefore have limited utility for identifying and measuring mechanisms of action. Clinicians may therefore benefit from targeting and monitoring domains of risk that go beyond IPT variables when providing treatment to acutely suicidal military personnel.

Conclusions based on the present findings should be made cautiously in light of several important limitations. First, our sample was comprised of active duty soldiers who were predominantly male. Results therefore may not generalize to non-military samples or military women. Second, our assessment of IPT variables were based on self-report methods, which could introduce response bias. Because self-report scales are practical for and widely used in medical and mental health settings, our results may be especially generalizable to professionals working in clinical settings. From a conceptual and scientific perspective, however, future studies should use alternative measurement schemes (e.g., physical pain threshold tasks to assess capability for suicide, startle reflex tasks to assess fearlessness about death) to further test IPT variables as potential mechanisms of change in the clinical care of high risk patients. Despite these limitations, the present study provides new information about why and how CBT reduces suicidal behavior among military personnel.

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