Efficacy of Psychological Pain Theory–Based Cognitive Therapy in Suicidal Patients with Major Depressive Disorder

1. Introduction

Suicide is a public health problem; about 1 million people commit suicide every year (WHO, 2001). Mood disorder is a leading cause of suicidal behavior (McGirr et al., 2007). According to the *Diagnostic and Statistical Manual of Mental Disorders*, 4th edition (DSM-IV), patients with depression experience changes in emotion (i.e., depressed mood, hopelessness), cognition (i.e., low self-esteem, guilt, difficulty with attention and memory, suicidal behavior), motivation and behavior (i.e., tardiness, anhedonia), and physical function (i.e., decreased or increased sleep and appetite). Patients are at greatest risk of attempting suicide during depressive episodes. Statistically, about 17% of depressive people in the US population commit suicide (Oquendo et al., 2001).

Given the difficulty of predicting when people will attempt suicide, suicide prevention efforts should focus on the phases of suicidal ideation and suicidal intent (McAuliffe, 2002). Psychologists have sought to identify proximal factors predicting suicidal ideation, and some influential theories have been proposed, including the hopelessness theory (Beck et al., 1993), the psychache theory (Shneidman, 1993), and the interpersonal theory (Van Orden et al., 2010). Our previous work demonstrated that pain avoidance was the most robust predictor of suicide attempt, compared with depression and psychache, among patients with major depression (Li et al., 2014). We proposed a three-dimensional psychological pain model in which psychological pain was composed of pain arousal, painful feelings, and active pain avoidance, with pain avoidance playing a central role in suicide prediction. The application of this theory in clinical practice would provide an important guide to increasing the efficiency of suicide prevention because theory-specific factors have been considered to be associated closely with treatment outcomes (Hamilton & Dobson, 2002).

A wealth of empirical data derived from randomized controlled treatment outcome

studies supports the relative efficacy of Cognitive behavioral therapy (CBT) (Beck, 1979) for depression (Clark et al., 2001). Although the evidence base for suicide prevention in depressed patients has not been well established, CBT is a promising intervention, and its application in this context warrants further research (Stefanie et al., 2013). The increasing sophistication of theoretical models and design manipulation associated with CBT has significant impacts on treatment outcomes (Hamilton and Dobson, 2002). In the present study, a group psychological pain theory–based cognitive therapy (PPTBCT) protocol was developed for the treatment of depressed suicidal patients. Its efficacy in decreasing suicide risk among patients with major depression was examined. Considering the contributory effects of pain avoidance on suicidal ideation and suicide attempt (Li et al., 2014; Xie et al., 2014), the aspects of PPTBCT employed in the present study aimed to communicate to patients that suicide as a means of pain avoidance is a problem, not a solution, when they feel unbearable pain; and to challenge cognitive distortions, replacing them with rational beliefs and learned problem-solving skills. Multiple assessments were conducted during the study period. We tested two hypotheses: (a) that depression, suicidal ideation, psychological pain, and pain avoidance scores would decline over time in the PPTBCT group compared with the UPC group; and (b) that automatic thought scores would decline and problem-solving scores would increase over time in the PPTBCT group compared with the usual psychological care (UPC) group.

2. Literature review

2.1 Depression, psychological pain, and suicide

Previous studies have demonstrated that depression plays an indispensable role in suicide, and that most depressive individuals attempt suicide during major episodes (Brådvik et al., 2008; Mattisson et al., 2015). However, not all depressed patients attempt suicide, even

during their most depressive moods, and not all individuals who commit suicide have experienced periods of depression (Harkavy-Friedman et al., 2004). Suicide may be a syndrome, independent of any DSM-IV axis I diagnosis (Rapinesi et al., 2012). Its proximal causes include not only state factors, such as depression, but also cognitive (e.g., dysfunctional thought, cognitive rigidity) and threshold (e.g., exposure to model, availability of means, acquired suicidal capability) factors (Mann et al., 1999; Smith et al., 2010; Orden et al., 2010).

Psychological pain or psychache, which is an inner experience of negative emotions (i.e., guilt, hopelessness, fear, loss) and a mental state caused by thwarted psychological needs (Shneidman, 1993), has been supposed to be a robust predictive variable for suicide. For example, psychological pain mediates the relationships between suicide and many other factors, such as depression, hopelessness, helplessness, and questioning of the meaning of life (Abramson et al., 1998; Orbach et al., 2003; Weishaar and Beck, 1992).

Behavioral evidence has recently accumulated for the predictive effect of psychological pain on suicide, which has outweighed the predictive relationship between depression and suicide. For example, the predictive effect of psychological pain on suicide has been shown to be much greater than those of depression and hopelessness in studies with non-clinical samples, such as college students (Troister and Holden, 2012), federal offenders (Pereira et al., 2010), and homeless individuals (Patterson and Holden, 2012), and in samples of clinically depressed patients experiencing depressive episodes (Mee et al., 2011).

2.2 The three-dimensional model of psychological pain and its relation to suicide

As a complex inner experience of mental state, psychological pain should be treated as a multifaceted construct, especially when it is used to explain suicide. However, existing measures emphasize psychological and physiological assessment of the magnitude of

psychological pain, with no consideration of cognitive (events inducing the pain) or motivational (behavioral tendency of pain avoidance) factors (Holden et al., 2001; Orbach et al., 2003;Orbach, et al., 2003; Mee et al., 2011). Considering the evidence from suicide notes and clinical interviews in which suicidal individuals have expressed that suicide is the only way to escape from the unbearable state of psychological pain (Shneidman, 1998, 2001, 2005), the level of pain avoidance motivation in relation to suicide risk deserves more attention. Thus, we proposed a three-dimensional model of psychological pain, in which psychological pain is constructed as pain arousal, painful feelings, and pain avoidance. Pain arousal is a cognitive factor involving negative appraisal and processing of traumatic life events. Painful feelings are psychological and physiological symptoms. Pain avoidance is defined as a behavioral tendency driven by a strong desire to escape from psychological pain, leading to the conviction that suicide is the only alternative. In a clinical sample of patients with major depression, pain avoidance was the only significant predictor of suicide attempt, and a stronger predictor of suicidal ideation than depression and psychache (Li et al., 2014).

The results of our previous work provided new ideas for systematic prevention efforts targeting depressed suicidal patients. For example, addressing the high level of motivation to avoid psychological pain may help to reduce suicide risk in these patients.

2.3 Psychological pain theory–based cognitive therapy

Psychiatrists currently take integrative approaches to the treatment of depression with suicide risk, which emphasize the importance of medication and psychotherapy (Stone and Crosby, 2014). A meta-analysis of the effects of psychotherapy revealed that it reduced the occurrence of suicide and self-harm behaviors by 32% in populations with high suicide risk (Team, 2007). CBT is the most prevalent and highly regarded psychotherapeutic modality used for depression. In practice, CBT has many variants with different theoretical bases

(Cuijpers et al., 2009). Even in patients with major depression, the curative effect of CBT is equivalent to that of antidepressants (Amick et al., 2015). Recent studies have provided supporting evidence for the effects of CBT on depression and suicide (Persons et al., 2001). . CBT suggests that, through Socratic questioning and evidence collecting, individuals will recognize their cognitive biases, replace distorted automatic thinking with alternative thinking (this process is called “cognitive reframing”), and eventually form adaptive emotional and behavioral reactions to negative life events. Researchers have developed many CBT variants with different purposes, such as mindfulness-based cognitive therapy (Morgan, 2003), dialectical behavior therapy (Linehan, 2013), and acceptance and commitment therapy (Hayes et al., 2011).

With the PPTBCT protocol in the present study, therapists can help patients with psychological pain with cognitive reframing and problem solving to decrease pain avoidance tendencies. The process consists of three steps: the detection of situations related to psychological pain, the identification of cognitive biases (particularly those related to pain avoidance) underlying these situations, and the execution of cognitive reframing and problem solving. To our knowledge, this is a pilot study which presents a framework for the application of cognitive therapy related to psychological pain theory for suicidal depressed patients in terms of the intervention procedure and effects.

3. Method

3.1 Participants

Depressed outpatients were recruited from the Sixth Hospital of Peking University. Assessments were conducted to determine their eligibility. Inclusion criteria were: (a) diagnosis of major depressive disorder (MDD) according to the DSM-IV criteria, with no history of hypomania or mania; (b) self-reported history of suicidal ideation, suicidal intent,

and/or suicide attempt; (c) Beck Depression Inventory-I (BDI-I; Beck et al., 1988) score of 5–20; (d) Beck Suicide Ideation Inventory (BSI; Beck et al., 1979) score ≥ 2 in the last week; (e) age 18–55 years; (f) educational level exceeding junior middle school; and (g) normal hearing and vision. Exclusion criteria were: (a) Mini-Mental State Examination (MMSE; Crum et al., 1993) score < 32 , (b) combined use of antipsychotic drugs, (c) brain injury or brain organic disease, (d) severe mental illness (i.e., schizophrenia, bipolar disorder), (e) mental retardation, and (f) severe and unstable somatic disease.

Enrollment was conducted during two time periods: depressed patients were allocated to the PPTBCT group in April–July 2015 and to the UPC group in September–December 2015. Of 51 participants assessed, 9 did not meet the inclusion criteria and 10 refused to participate. The final sample of clinical patients included 32 participants (19 in the PPTBCT group and 13 in the UPC group). All patients had suicidal ideation and intent; only one individual had attempted suicide.

Healthy controls were recruited from four universities by advertisement and were compensated monetarily. Inclusion criteria for the healthy control group were: (a) BDI scores < 7 ; (b) both items 4 and item 5 of BSI score zero points (c) without a history of physical disease or mental disorders, such as mood disorder, schizophrenia, anxiety disorder, or personality disorder.

3.1 Study design

This study was designed as an 8-week intervention (2 sessions/week, 16 sessions in total) to compare PPTBCT with usual psychological care. The Institutional Review Board of the Sixth Hospital of Peking University approved the study protocol, and all participants provided informed consent. A 2 by 2 mixed-effect factorial design was used to assess psychological outcome measures. The psychological measures were conducted by a clinical

nurse who was blind to group identity.

3.2 Intervention procedure

The PPTBCT intervention was carried out in groups (5 persons/group), whereas participants in the UPC group received usual psychological care on an individual basis. The usual psychological care was provided by a well-trained clinical psychologist in order to monitor their emotional disturbance and suicidal ideation and to provide them affective support. Based on the standard intervention setting in cognitive therapy, specific tactics were taught each week. The first session in each week consisted of a brief introduction to the tactic and a homework assignment, and the second session involved mainly discussion of the homework and sharing -. Each PPTBCT session lasted 45 minutes and was also provided by a well-trained clinical psychologist.

In the present study, the 16 PPTBCT sessions (S) had the following structure: S1-S2: Psychological education - introducing group rules to be followed in the therapy phrase, epidemiology of depression and suicide, the relationship between psychological pain and suicide and setting goals for treatment; S3-S4: Automatic thought- introducing automatic thought; practicing Socratic questioning and finding the automatic thinking behind painful experiences; S5 – S8: Introducing cognitive bias closely related to painful experiences and suicide; S9: disputing these irrational belief systems related to pain avoidance which include selective abstract-focusing, overgeneralization and all-or-nothing thinking. For example, “My pain hurts so badly that death could be the only way to escape from it”, “My experience was very unfortunate, which makes me feel a great deal of pain”, “This kind of psychological pain is “unbearable”. I really want to get rid of it, but I have no way to do so”; S10-S12 Restructuring rational belief systems - exposing motivation for escaping painful feelings and irrational belief systems pertinent to suicide, and replacing them with rational belief systems;

S13 – S14: Problem solving skills training; S15 - S16: Review and relapse prevention - discussing experiences and goals achieved in the therapy period and how to monitor cognitive bias and self-control when they expose to painful situations in the future.

3.3 Measures

To capture the effects of PPTBCT, we evaluated primary outcomes (depressive symptoms, suicidal ideation, and psychological pain) and secondary outcomes (automatic thoughts, problem solving) in the pre-intervention, post-intervention, and follow-up (4 weeks post-intervention) periods. Considering the potential confounding effect of external stress, the impacts of negative life events were also evaluated pre-intervention as covariates. As all measures used were self-reported, the results may have been influenced by common method bias, social desirability motivations, or faking. Consequently, we also evaluated therapeutic effects in semi-structured interviews, which included questions about participants' mental states, cognitive styles, daily activities, suicide risk, gains and progress, and perceived shortcomings of the intervention.

The 21-item BDI-I (Beck et al., 1988) is used to evaluate the severity of depression. Each item represents a “symptom-attitude type,” with responses structured by a 4-point scale ranging from 0 (no symptom) to 3 (most severe). Final scores are calculated by summing all item scores, and higher scores indicate more severe depressive symptoms. The Chinese version of this instrument (BDI-I-CV) has been validated and used widely in Chinese populations (Zhang et al., 1990). In the current sample, the BDI-I-CV showed excellent internal consistency (Cronbach's $\alpha = 0.90$).

The 19-item BSI (Beck et al., 1979) is used to evaluate the severity of current wishes and plans to commit suicide, typified by phrases such as “To what extent you want to live?”. The Chinese version of this instrument was translated and revised by the Beijing Suicide

Research and Prevention Center (Li et al., 2010). Responses to each item refer to two periods: the last week and the most severe time (at the peak of depression or suicidal tendency). Items are rated on a 3-point scale that ranges from 0 (not at all) to 2 (extremely). In the present study, only the “last week” subscale (current suicidal ideation) was used. In the current sample, this subscale showed excellent internal consistency (Cronbach’s $\alpha = 0.92$).

The 17-item Three-Dimensional Psychological Pain Scale (TDPPS; Li et al., 2014) is used to assess the severity of psychological pain. It has three subscales: pain arousal, painful feelings, and active pain avoidance. Responses to each item are structured by a scale ranging from 1 (not at all) to 5 (extremely). The total score is the sum of all item scores, and each subscale score is the sum of component item scores. In the current sample, the internal consistency of the TDPPS (Cronbach’s $\alpha = 0.84$) and the three subscales (pain arousal, Cronbach’s $\alpha = 0.60$; painful feelings, Cronbach’s $\alpha = 0.85$; pain avoidance, Cronbach’s $\alpha = 0.77$) was sufficient.

The 35-item Problem Solving Inventory (PSI; Heppner and Petersen, 1982) is used to assess the extent of respondents’ perceived problem-solving ability, typified by phrase such as “When the first time I fail to solve a problem, I’ll be anxious about my ability.”. Items are rated on a 6-point scale that ranges from 1 (strongly disagree) to 6 (strongly agree). Total scores are calculated by summing all item scores. Higher scores indicate greater confidence in problem solving. In the current sample, the internal consistency of the PSI was sufficient (Cronbach’s $\alpha = 0.69$).

The 30-item Automatic Thoughts Questionnaire (ATQ; Hollon and Kendall, 1980) is used to assess the frequency of negative automatic thoughts relevant to depression, typified by phrases such as “No one understands me”, “I can never do it well”. Items are rated on a 5-point scale that ranges from 1 (never) to 5 (always). Total scores are calculated by summing

all item scores, with higher scores indicating more frequent occurrence of automatic thoughts. In the current sample, the ATQ showed excellent internal consistency (Cronbach's $\alpha = 0.97$).

The 48-item Life Events Scale (Yang and Zhang, 1999) was designed to assess the impacts of positive and negative life events on individuals. In the present study, we used only the Impact of Negative Life Events (INLES) as an index of external stressors. Participants responded yes (score = 1) or no (score = 0) for whether each negative stressful life event, such as divorce or unemployment had happened to them within the past 12 months. For each "yes" response, participants firstly assessed the severity of the stressor, yielding a score of 1 (no effect), 2 (mild effect), 3 (rather serious), or 4 (very serious). Higher scores indicate more stress. In the current sample, the INLES showed excellent internal consistency (Cronbach's $\alpha = 0.82$).

The Mini-Mental State Examination (MMSE; Crum et al., 1993) is a widely used screening instrument for dementia. It was consists of 11 items used to assess abilities of counting, recognition and remote memory related to cognitive impairment, with each item scored as "0" (unknown or incorrect) or "1" (correct). According to the guidelines, respondents with total MMSE scores < 32 can be regarded as having cognitive impairment.

In the post-intervention period, semi-structural interviews about participants' feelings, thoughts, and perceived benefits from the intervention were conducted with patients in the PPTBCT group.

3.4 Statistical analysis

The statistical analysis was performed using the Statistical Package for Social Sciences (version 17.0 for Windows; SPSS Inc., Chicago, IL, USA). Descriptive analyses were performed for all variables. Baseline characteristics were compared between groups using the

independent-sample *t*-test for quantitative variables and the chi-squared test for qualitative variables. Pearson correlation coefficients were used to assess the strengths of linear relationships between pairs of variables of interest.

Considering missing data can result in biased estimates of the association between an independent variable and an outcome variable, we used the expectation-maximization recommended by Newgard and Lewis (2015) to impute the missing data of all the outcome measures. Univariate Statistics showed that, there were 10 cases missing at T2, 11 cases missing at T3. Little MCAR (Missing Completely At Random) estimation indicated that the missing data were random ($\chi^2=7.385$, $df=70$, $p= 0.999$). Then, the missing data was imputed by maximum likelihood estimation using the original data.

The effects of the interventions on outcome measures were determined using two-way mixed-effects repeated-measures analysis of variance (RMANOVA) for the intention-to-treatment sample (all randomized participants) (Amico, 2009), with group serving as the between-subjects factor and time (time point 1, pre- intervention; time point 2, post-intervention; time point 3, four weeks post-intervention) serving as the within-subject factor, age and INLES score serving as a covariate, and BDI, BSI, and TDPPS scores analyzed separately as outcome variables. Partial eta squared (η^2) values were calculated to measure effect sizes. The group and pre–post main effects were interpreted with consideration of significant two-way interactions.

4 Results

4.1 Demographic and clinical characteristics of study groups

At baseline, all participants completed the assessment. With exception of age ($F_{1,30}=22.49$, $p<0.001$), there was no statistically significant difference in gender or educational levels between the depressed group and healthy controls. After controlling for

age, significant differences between the depressed patient group and healthy controls were observed in BDI-I scores ($F_{1,30} = 61.21, p < 0.001$), overall TDPPS scores ($F_{1,30} = 46.82, p < 0.001$), TDPPS sub-scores (pain arousal: $F_{1,30} = 56.71, p < 0.001$; painful feelings: $F_{1,30} = 18.70, p < 0.001$; pain avoidance: $F_{1,30} = 24.73, p < 0.001$), BSI scores (BSI-W: $F_{1,30} = 47.54, p < 0.001$; BSI-C: $F_{1,30} = 14.82, p < 0.001$), PSI scores ($F_{1,30} = 8.42, p = 0.001$), and LES sub-scores (LES-N: $F_{1,30} = 11.70, p < 0.001$; see Table 1).

Insert Table 1 here

During a 16-session intervention period, Of 19 patients allocated to the PPTBCT group, 12 attended all intervention sessions, 7 dropped out. The dropout rate in PPTBCT group was 36.8%. Specifically, all participants in PPCBCT group attended 1-2 sessions; 89.5% (N=17) attended 3-4 sessions; 78.9% (N=15) attended 5-6 sessions; 68.4% (N=13) attended 7-8 sessions; 63.1% (N=12) attended 16 sessions. Of 13 patients allocated to the UPC group, 10 attended all sessions and 3 dropped out. All depressed patients who completed the intervention also completed the follow-up assessment. All demographic and clinical variables except age were similar in the two depressed groups (Table 2).

Insert Table 2 here

4.2 Relationships among depression, suicide, psychological pain, negative life events, and automatic thoughts

Total BDI scores were correlated positively with current suicidal ideation ($r = 0.65, p < 0.01$), total TDPPS scores ($r = 0.65, p < 0.01$), pain arousal ($r = 0.62, p < 0.01$), painful feelings ($r = 0.43, p < 0.01$), pain avoidance ($r = 0.57, p < 0.01$), total ATQ scores ($r = 0.68, p < 0.01$), and INLES scores ($r = 0.36, p < 0.05$). Current suicidal ideation showed strong positive correlations with total TDPPS scores ($r = 0.72, p < 0.01$) and pain avoidance ($r = 0.72, p < 0.01$). Total TDPPS scores were correlated positively with ATQ scores ($r = 0.56, p < 0.01$).

0.01) and INLES scores ($r = 0.37, p < 0.05$). PSI scores were correlated negatively with ATQ scores ($r = -0.386, p < 0.01$).

4.3 Changes in clinical measures during the 8-week treatment period

A main effect of time ($F_{1, 30} = 3.31, p < 0.05, \eta_p^2 = 0.19$) and interaction between time and group ($F_{1, 30} = 3.71, p < 0.05, \eta_p^2 = 0.21$) on BDI scores was identified. Levels of depressive symptoms were lower in the post-intervention and follow-up periods than at pre-intervention in both groups. At post-intervention, PPTBCT group scored lower than UPC group in BDI ($p < 0.05$). For BSI scores, the main effect of time was not significant, but interaction between time and group ($F_{2, 27} = 5.08, p < 0.05, \eta_p^2 = 0.27$) was identified. Post-intervention and follow-up BSI scores were lower in the PPTBCT group than the UPC group. However, BSI scores increased significantly from post-intervention to follow-up in the UPC group ($p < 0.05$), and did not differ between post-intervention and follow-up in the PPTBCT group. For TDPPS total scores, AROUSAL and FEELING subscale scores, neither main effect of time nor interaction between time and group was detected. However, for AVOIDANCE subscale scores, there was an interaction between time and group ($F_{2, 27} = 3.36, p < 0.05, \eta_p^2 = 0.20$, Figure 1c). Post-intervention AVOIDANCE score did not differ between the PPTBCT group and the UPC group, however, follow-up AVOIDANCE score was lower in the PPTBCT group than the UPC group ($p < 0.01$). RMANOVA results showed no main effect or interaction effect on ATQ and PSI scores was detected (Table 3).

Insert Table 3 here

In summary, pre-protocol analyses showed that PPTBCT and usual psychological care had similar effects on BDI, BSI, TDPPS, AROUSAL, FEELING, and ATQ scores, as indicated by mean changes in pre–post measures. Further, an interaction between time and group was identified on BSI scores, indicating that BSI scores in the PPTBCT group

remained low at follow-up, but not in the UPC group. In intent-to-treat analyses, the interventions had different effects on depression symptoms, current suicidal ideation and pain avoidance scores, as indicated by significant time by group interaction effects. PPTBCT group demonstrated significantly lower post-intervention BDI scores, post-intervention and follow-up BSI scores, follow-up AVOIDANCE score than the UPC group.

4.4 Interview outcomes

Most (88.9%) participants in the PPTBCT group reported decreased avoidance motivation and more positive attitudes about the future; 84.6% of participants reported improvement in social relationships. In addition, 76.9% of participants had no suicidal ideation in the last week, and reported deepened self-awareness. The majority (69.3%) of participants reported improved mental state. Portions of participants claimed that they had more flexible cognitive styles and more regulated sleep time, and that they were more efficient at school/work and more tolerant of others.

5. Discussion

The present exploratory evidence-based pilot study was conducted to compare the outcomes of PPTBCT and usual psychological care in suicidal patients with MDD. BDI, BSI and pain avoidance scores showed a consistent maintenance effect in the PPTBCT group, but not in the UPC group. Unexpectedly, other primary outcomes (i.e., total TDPPS scores, AROUSAL and FEELING subscale scores) and secondary outcomes (ATQ and PSI scores) showed no maintenance effect in the PPTBCT group compared with the UPC group. Further, semi-structure clinical interview also provided a support for the clinical value of PPTBCT in decreasing avoidance motivation and improving social relationship and mental state. These findings suggest that disputing the cognitive bias of pain avoidance and replacing it with adaptive coping skills can help decrease suicide risk in depressed patients.

In the present study, TDPPS, painful feelings, pain arousal and pain avoidance scores were significantly higher in suicidal depressed patients than healthy controls. Further, Our findings of positive correlations between BDI and BSI scores, and strong positive correlations between TDPPS (especially pain avoidance) scores and BSI scores, provide supporting evidence for the greater contribution of psychological pain than depression to suicide. These findings are consistent with our previous works showing that pain avoidance was a robust predictor of suicidal ideation (Li et al., 2014). Suicide is a complex phenomenon with multifaceted contributing factors. Although depressive symptoms have been correlated with suicide in cross-sectional studies (Jakobsen et al., 2013; Oquendo et al., 2004) and longitudinal studies (Beck and Steer, 1989; Simon et al., 2013), suicide may be independent of depression. Section III of the DSM-V (Am. Psychiatr. Assoc., 2013) indicates that an improved understanding of “suicidal behavior disorder” (suicide attempts in the past 24 months) is needed, and that its classification may change in forthcoming DSM editions. In addition, depression has been found to be a predictive factor for suicide in individuals with suicidal ideation, but depression scores were not higher among individuals who had attempted suicide than among those who had not (May and Klonsky, 2016). Among suicide attempters, psychological pain proved to be a predictor of suicide. Individuals with MDD and high suicide risk reported greater psychological pain than did those with low suicide risk (Li et al., 2014).

Suicidality as a state-like variable can be reduced via effective intervention strategies (Kessler et al., 2012). BSI scores were lower in the PPTBCT group than in the UPC group at the post-intervention and 4-week follow-up time points in the present study demonstrates the current and maintenance effects of PPTBCT in reducing the likelihood of suicide. As PPTBCT targets pain avoidance, the direct predictor of suicide, it can contribute uniquely to

suicide reduction. Regarding pain avoidance, 88.9% of individuals in the PPTBCT group reported decreased avoidant motivation in interviews, and pain avoidance scores differed significantly at follow-up between the PPTBCT and UPC groups. These results indicated that PPTBCT was effective in decreasing avoidant motivation. However, UPC did not resolve the presence of pain avoidance. PPTBCT proved to be a successful evidence-based intervention, bridging the gap between theory and practice. Paradoxically, however, we did not see similar patterns in the total TDPPS scores, pain arousal subscale and painful feeling subscale scores. Psychological pain declined in both groups at a similar pace throughout the intervention and follow-up periods. Psychological pain theory provides an explanation for this finding: psychological pain acts as a threshold variable in the context of suicide. If the level of psychological pain fluctuates within a range that does not surpass the threshold, suicidal ideation will not evolve into suicide attempt. This threshold varies among individuals and time points. PPTBCT provides tactics that individuals can use to deal with stressful situations inducing pain arousal, which up-regulates the threshold of psychological pain and down-regulates avoidant motivation, ultimately reducing suicide risk. This process explains the lower BSI scores in the PPTBCT group than in the UPC group in the present study, although both groups showed the similar level of psychological pain.

Furthermore, participants reported decreased depression throughout the intervention, implying that PPTBCT and UPC had equivalent effects on depressive symptoms, although the effects of PPTBCT on depressive symptoms were stronger. We observed no main effect of time or time $\times$ interaction for automatic thinking and problem solving in either group, which may be due to the small sample.

An understanding of the motivations of individuals with suicide risk is key to alleviating this risk, if the intervention focuses on providing alternative solutions to the

problem (Harmon et al., 2016). PPTBCT targets the reduction of motivation to escape unbearable psychological pain. The logic of PPTBCT is based on cognitive therapy, comprising the following steps: (a) awareness of pain arousal, specific painful feelings, and the automatic thoughts underlying them; (b) identification of alternative thinking or solutions for the situation; (c) and, eventually, the reduction of avoidant motivation. An obvious advantage of PPTBCT is that it enables direct processing with respect to the three dimensions of psychological pain (arousal, feelings, and avoidance), which has been proven to be a strong predictor of suicide. Without doubt, this intervention is promising for suicidal individuals.

One limitation of the present study is that the sample was small ($n = 32$) and consisted primarily of individuals with suicidal ideation and intent; only one individual had attempted suicide. As a consequence, the conclusions may not be generalized to populations including individuals who have attempted suicide. Future research including more such participants is highly recommended. Although such work is challenging, with many obstacles to overcome, such as ethical issues and the difficulty of finding attempters because of heavy stigmatization, efforts to provide more evidence for effective suicide prevention are warranted. Another study limitation is that all assessment tools were self-reported, with no use of clinician-administrated tools or other objective task paradigms. Practitioners in the field of suicide prevention should take full advantage of advances in psychological research to assess suicide risk more precisely; for example, affective incentive delay (AID) and the monetary incentive delay(MID task paradigms with negative conditions (Xie et al., 2014) can be used to capture avoidant motivations objectively. Regarding the evaluation of outcomes related to cognitive therapy, direct assessment with the Dysfunctional Attitude Scale (Chioqueta and Stiles, 2007) should be considered.

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Table 5. Results of multivariate RMANOVA for significant psychological outcome measures

Effect	<i>F</i>	<i>p</i>	Partial η^2
BDI			
Time	3.31	<0.05	0.19
Time * group	3.71	<0.05	0.21
BSI-C			
Time	0.03	ns	/
Time * group	5.08	<0.05	0.27
TDPPS			
Time	2.41	ns	/
Time * group	1.44	ns	/
AROUSAL			
Time	1.00	ns	/
Time * group	0.79	ns	/
FEELINGS			
Time	2.20	ns	/
Time * group	1.42	ns	/
AVOIDANCE			
Time	2.89	0.072	0.17
Time * group	3.36	<0.05	0.20
ATQ			
Time	0.30	ns	/
Time * group	0.36	ns	/
PSI			
Time	1.42	ns	/
Time * group	0.94	ns	/

Note: BDI, Beck Depression Inventory; BSI-W, Beck Suicidal Inventory-at one's worst point; TDPPS, Three-dimensional Psychological Pain Scale; AROUSAL, Pain arousal subscale; FEELING, Painful feelings subscale; AVOIDANCE, Pain avoidance subscale; ATQ, Automatic Thoughts Questionnaire; PSI, Problem Solving Inventory.

Table 2. Baseline demographic and clinical characteristics of depressed patients

Variable	PPTBCT (<i>n</i> = 19)	UPC (<i>n</i> = 13)	<i>p</i>
Demographic characteristics			
Age (years)	32.7 (10.2)	25.6 (5.9)	0.044*
Gender			0.860
Male	7 (36.8%)	5 (38.5%)	
Female	12 (63.2%)	8 (61.5%)	
Educational level (years)	15.7 (2.6)	14.8 (2.7)	0.441
Clinical characteristics			
Age at depression onset (years)	30.5 (9.8)	23.8 (6.7)	0.188
Episodes of depression			0.206
First episode	8 (42.1%)	4 (30.8%)	
Recurrent	11 (57.9%)	9 (69.2%)	
Current medication use			0.352
SSRI	6 (31.6%)	8 (61.5%)	
SNRI	7 (36.8%)	5 (38.5%)	
SSRI & SNRI	1 (5.3%)	0	
Self-reported suicide risk			0.100
Suicidal ideation	19 (100%)	13 (100%)	
Suicidal intent	9 (47.4%)	4 (30.8%)	
Suicide attempt	1 (5.3%)	4 (30.8%)	
BDI score	32.9 (10.8)	32.0 (12.0)	0.946
BSI score	9.2 (7.1)	10.4 (10.0)	0.218
TDPPS score	59.2 (11.1)	62.7 (10.4)	0.748
INLES score	156.4 (117.6)	107.2 (118.3)	0.716

Note: Data are mean (standard deviation) or *n* (%). PPTBCT, Psychological Pain Theory–Based Cognitive Therapy; UPC, usual psychological care; SSRI, Selective Serotonin Reuptake Inhibitor; SNRI, Serotonin and Noradrenaline Reuptake Inhibitor; BDI, Beck Depression Inventory; BSI-W, Beck Suicide Ideation Inventory, at one's worst points; TDPPS, Three-Dimensional Psychological Pain Scale; INLES, Impact of Negative Life Events. **p* < 0.05.

Table 1. Differences in baseline demographic and questionnaire scores between depressed group and healthy controls.

Variable	Depressed group (N=32)	Healthy controls (N=32)	F/X ²	<i>p</i>
Age(years)	30.0(9.45)	21.88(2.12)	22.49	<0.001
Gender			1.87	>0.05
Male	12(37.5%)	7(21.9%)		
Female	20(62.5%)	25(78.1%)		
E d u c a t i o n a l level(years)	15.45(2.77)	16.47(1.43)	3.38	.>0.05
BDI	31.56(12.41)	1.87(1.66)	61.21	<0.001
BSI-C	9.44(8.41)	0.22(0.42)	14.82	<0.001
BSI-W	19.75(9.59)	2.06(2.41)	47.54	<0.001
TDPPS	60.66(10.85)	32.31(9.11)	46.82	<0.001
Arousal	27.91(5.41)	13.34(3.73)	56.71	<0.001
Feelings	24.19(3.72)	15.81(5.67)	18.70	<0.001
Avoidance	8.56(3.59)	3.16(0.72)	24.73	<0.001
PSI	113.16(20.33)	131.59(12.25)	8.42	0.001
ATQ	106.28(27.38)	47.78(9.34)	50.82	<0.001
LES-P	17.03(26.38)	12.03(12.60)	1.72	>0.05
LES-N	136.47(118.59)	17.78(17.47)	11.70	<0.001

Note: Data are mean (standard deviation) or *n* (%).BDI, Beck Depression Inventory; BSI-W, Beck Suicide Ideation Inventory, at one's worst points; TDPPS, Three-Dimensional Psychological Pain Scale; Arousal, Pain Arousal Subscale; Feelings, Painful Feelings Subscale; Avoidance, Pain Avoidance Subscale; PSI, Problem Solving Inventory; ATQ, Automatic Thinking Questionnaire; LES-P, Positive life Events; LES-N, Negative life events.

$p < .01^{**}$

Figure 1. AVOIDANCE scores of both groups at pre-intervention, post-intervention, and follow-up. AVOIDANCE= pain avoidance; PPTBCT, Psychological Pain Theory Based Cognitive Therapy; UPC= usual psychological care; Error bars, Standard error of the mean. $^{**}p < .01$.