

Changes in problem-solving appraisal after cognitive therapy for the prevention of suicide

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Background. Cognitive therapy has been found to be effective in decreasing the recurrence of suicide attempts. A theoretical aim of cognitive therapy is to improve problem-solving skills so that suicide no longer remains the only available option. This study examined the differential rate of change in problem-solving appraisal following suicide attempts among individuals who participated in a randomized controlled trial for the prevention of suicide.

Method. Changes in problem-solving appraisal from pre- to 6-months post-treatment in individuals with a recent suicide attempt, randomized to either cognitive therapy ($n=60$) or a control condition ($n=60$), were assessed by using the Social Problem-Solving Inventory-Revised, Short Form.

Results. Improvements in problem-solving appraisal were similarly observed for both groups within the 6-month follow-up. However, during this period, individuals assigned to the cognitive therapy condition demonstrated a significantly faster rate of improvement in negative problem orientation and impulsivity/carelessness. More specifically, individuals receiving cognitive therapy were significantly less likely to report a negative view toward life problems and impulsive/carelessness problem-solving style.

Conclusions. Cognitive therapy for the prevention of suicide provides rapid changes within 6 months on negative problem orientation and impulsivity/carelessness problem-solving style. Given that individuals are at the greatest risk for suicide within 6 months of their last suicide attempt, the current study demonstrates that a brief cognitive intervention produces a rapid rate of improvement in two important domains of problem-solving appraisal during this sensitive period.

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Introduction

One of the most clinically relevant risk factors for suicide is a prior suicide attempt (Gunnell & Frankel, 1994; Brown *et al.* 2000). Meta-analytic findings indicate that individuals who attempt suicide are 38 times (95% CI 34.03–43.08) more likely to die by suicide (Harris & Barraclough, 1997) and likely to benefit from treatments focused on problem solving (Townsend *et al.* 2001). The period of highest risk is generally within the first 3–6 months after the suicide attempt (Hawton & Fagg, 1988; Goldacre *et al.* 1993; Ho, 2003; Cooper *et al.* 2005). The average rate of repeat suicide attempts is approximately 15–16% at 1 year and 20–25% over the following years (Owens *et al.* 2002).

As many as 1.8% of individuals who attempt suicide die by suicide in the year following the attempt (Jenkins *et al.* 2002). The rate of suicide over a 22-year time span following hospitalization for a suicide attempt is estimated at 4.3 (2.4–7.7) per 1000 per year (Jenkins *et al.* 2002).

Cognitive therapy for the prevention of suicide is an efficacious and targeted manualized out-patient treatment for individuals who have attempted suicide. Within this group, cognitive therapy results in a 50% reduction in the recurrence of suicide-related behaviors (Brown *et al.* 2005). Theoretically, cognitive therapy views a suicide attempt as a maladaptive coping strategy meant to address extreme psychological distress and hopelessness posed by perceived life problem(s) (Ghahramanlou-Holloway *et al.* 2008; Wenzel *et al.* 2009). Individuals who attempt suicide (whether choosing the behavior or not) are conceptualized as poor problem-solvers who are unable to generate or consider all alternative options available

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in their immediate or remote future. The inability to generate options may be related to what researchers have coined as 'cognitive rigidity', defined as the inability to identify problems and corresponding solutions (Schotte & Clum, 1982).

Individuals who attempt suicide have severe difficulties in problem solving, as indicated by passive approaches to problems as well as notable deficits in producing versatile and relevant solutions to problems compared with those with suicide ideation and psychiatric controls (Linehan *et al.* 1987; Orbach *et al.* 1990; Pollock & Williams, 2001). For example, in one study (Rotheram-Borus *et al.* 1990), a group of adolescent females who had attempted suicide generated fewer alternative solutions for an interpersonal problem compared with two control groups. In another study, incarcerated young offenders with suicide-related behaviors demonstrated more irrelevant and passive methods of problem solving (Biggam & Power, 1999).

A strong association between problem-solving appraisal (defined as a cognitive evaluation about one's ability to solve problems), stress and hopelessness in individuals with suicide-related behaviors has been noted (Dixon *et al.* 1991, 1994; Rudd *et al.* 1994). Schotte & Clum's (1982, 1987) diathesis-stress-hopelessness model of suicide views problem solving as both a mediator and moderator of the relationship between stress and hopelessness – two factors predictive of suicide-related behaviors. Individuals with suicide-related behaviors and hopelessness appear to generate only half the number of possible solutions to their own interpersonal problems compared with controls (Schotte & Clum, 1982, 1987).

The complex relationship between problem-solving deficits and suicide-related behaviors has been documented in clinical (Linehan *et al.* 1987; Evans *et al.* 1992) as well as non-clinical (Bonner & Rich, 1988; Priester & Clum, 1993; Clum & Febbraro, 1994; Biggam & Power, 1999) samples. However, to date, there is a lack of scientific understanding about the role of targeted psychotherapy for the prevention of suicide in maximizing and/or accelerating favorable changes in problem-solving appraisal, which may subsequently be associated with the reduction of suicide recurrence. The primary objective of this study was to examine changes over time in problem-solving appraisal among a sample of individuals with a recent suicide attempt. The secondary objective was to compare the differential rates of change in problem-solving appraisal over a 6-month follow-up period for individuals receiving and not receiving cognitive therapy following a suicide attempt within the context of a randomized controlled trial. A third objective was to evaluate the association between improved

problem-solving appraisal and risk factors for suicide, including depression, hopelessness and suicide ideation. We hypothesized that individuals receiving cognitive therapy compared with those in the control group would (1) report improved problem-solving appraisal during the 6-month follow-up and (2) accomplish gains in various domains of problem-solving appraisal at a statistically faster rate. In addition, improvements in problem-solving appraisal, as demonstrated by the cognitive therapy group during follow-up, were expected to be associated with decreased severity of depression, hopelessness and suicide ideation.

Method

Procedure

Information for the current study was collected as part of a randomized controlled trial examining the efficacy of cognitive therapy for the prevention of suicide (Brown *et al.* 2005). Individuals seen at the Hospital of the University of Pennsylvania's Emergency Department within 48 h of a suicide attempt were randomized to receive either cognitive therapy + enhanced usual care (EUC; $n=60$) or EUC ($n=60$). EUC included community-based usual care as well as assessment services offered by the study at six time intervals, tracking and referral services of a study case manager for 2 years. Participants in cognitive therapy were scheduled to receive 10 weekly or biweekly outpatient sessions designed to prevent future suicide attempts. A cognitive case conceptualization was formulated to identify thoughts, images and emotions that precipitated the suicide attempt. Vulnerability areas[†] including hopelessness, poor coping, impaired impulse control, non-compliance with concurrent treatments and social isolation were addressed. Further, cognitive therapy targeted ineffective problem solving and taught patients to generate, evaluate and implement alternative solutions to perceived life problems.

Treatment was terminated not based on a fixed number of sessions received but after successful completion of a relapse prevention task, designed to evaluate whether adaptive approaches would be used in response to hypothetical future suicidal crises. Participants were aged >16 years, English speaking, able to provide informed consent, available to complete a baseline assessment and willing to provide at least two verifiable contacts to improve study tracking. Individuals with a medical or psychiatric disorder that

[†] The notes appear after the main text.

would prevent participation in a psychotherapeutic intervention were excluded.

The blinded baseline assessment was conducted within 3 days but no longer than 3 weeks after the suicide attempt by trained clinicians who held a master's or a doctoral degree in clinical psychology. Follow-up assessments were performed independently by study assessors at 1, 3, 6, 12 and 18 months after baseline. Blinding at the time of follow-up was not feasible for two reasons: (1) the evaluation of a suicide attempt involved an investigation of the circumstances preceding and following the suicide attempt, which presented clues to the group assignment; (2) information regarding treatment assignment was often essential for adequate clinical management of acutely suicidal individuals (Brown *et al.* 2005).

Demographic and clinical characteristics of participants

Detailed demographic and clinical information about study participants is provided in an earlier publication reporting the results of the randomized controlled trial (Brown *et al.* 2005). A brief summary is provided below.

Participants ranged in age between 18 and 66 years with a mean age of 35 (S.D. = 10.3). Racial composition consisted of approximately 60% African-American, 35% Caucasian, 1% Hispanic, 2.5% Native American and 2% other. The majority of participants were female (61%), never married (57%) and without a college education (71%). Approximately half (47%) were unemployed. Diagnostic decisions were made based on the Structured Clinical Interview for Axis I of the Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition (Spitzer *et al.* 1995) and a study psychologist who reviewed symptoms. At baseline, co-morbidity was common with major depressive disorder accounting for 77% of Axis I diagnoses and substance disorders accounting for 68% (alcohol, cocaine and heroin dependence were among the top three within this category). The average number of previous suicide attempts for our sample was five (S.D. = 10.1) per participant. Groups did not differ significantly on demographic variables (e.g. sex, education, race, marital status, employment and income) and prevalence of major depressive disorder, substance disorder or prevalence of suicide ideation at baseline.

Treatment length for participants in the cognitive therapy group

Participants in the cognitive therapy group received an average of 8.92 (S.D. = 5.97) out-patient sessions

(range 0–24). Half of the participants ($n=30$) received ≥ 10 cognitive therapy sessions so that the relapse prevention task would be successfully completed. Approximately 46.7% ($n=28$) received one to nine sessions. Finally, 3.3% ($n=2$) did not participate in scheduled cognitive therapy sessions. At the 6-month follow-up, 37 (61.7%) of cognitive therapy patients were still participating in treatment.

Measures

Beck Depression Inventory-II (Beck et al. 1996)

The Beck Depression Inventory-II is a 21-item, psychometrically supported, self-report instrument to measure severity of depression. Higher scores indicate more severe depressive symptomatology.

Beck Hopelessness Scale (Beck & Steer, 1988)

The Beck Hopelessness Scale is a 20-item, psychometrically supported, true-false self-report instrument to assess the level of positive and negative beliefs about the future. Higher scores reflect greater hopelessness.

Scale for Suicide Ideation (Beck et al. 1976)

The Scale for Suicide Ideation is a 21-item, psychometrically supported, interviewer-administered instrument to assess the severity of current suicide ideation. Higher scores demonstrate more severe suicide ideation.

Social Problem-Solving Inventory-Revised, Short Form (D'Zurilla et al. 2002)

The Social Problem-Solving Inventory – Revised Short Form is a 25-item self-report measure of social problem solving. The measure assesses two specific domains of problem solving: (1) orientation; (2) style. Orientation to problem solving comprises two subscales: positive problem orientation and negative problem orientation. Those with a positive problem orientation perceive problems as solvable challenges that with persistence and commitment can be overcome (e.g. 'When I have a problem, I try to see it as a challenge or opportunity to benefit in some positive way from having a problem'). Those with a negative problem orientation perceive problems as threats that are frustrating and unmanageable (e.g. 'I feel nervous and unsure of myself when I have an important decision to make').

Style of problem solving consists of three subscales: (1) rational problem solving (e.g. 'When I have a problem to solve, one of the first things I do is try to get as many facts about the problem as possible');

Table 1. Means and s.d. of SPSI-R:S in normative sample compared with RCT sample consisting of individuals with a recent suicide attempt

	Mean (<i>n</i> = 950) ^a Normative sample (age 17–39 years)		Mean (<i>n</i> = 100) ^a Normative sample (age 40–55 years)		Mean (<i>n</i> = 120) RCT sample (age 18–66 years)	
		s.d.		s.d.		s.d.
PPO	11.89	3.90	13.53	3.85	9.33	4.7
NPO	8.10	4.65	5.15	3.85	11.95	5.1
RPS	10.98	3.76	12.11	3.59	8.66	5.3
ICS	7.09	3.95	4.80	4.31	9.75	5.1
AS	6.95	4.75	4.38	3.70	10.69	5.6
SPSI-R:S	–	–	–	–	9.09	3.8

SPSI-R:S, Social Problem Solving Inventory – Revised Short Form; RCT, randomized controlled trial; PPO, positive problem orientation; NPO, negative problem orientation; RPS, rational problem solving; ICS, impulsivity/carelessness style; AS, avoidance style.

^aNormative data provided in the technical SPSI-R:S manual (D’Zurilla *et al.* 2002, p. 65).

(2) avoidant style (e.g. ‘I spend more time avoiding my problems than solving them’); (3) impulsivity/carelessness style (e.g. ‘When making decisions, I go with my “gut” feeling without thinking too much about the consequences of each option’). The total Social Problem-Solving Inventory-Revised Short Form score and each of the five subscales have a mean of 100 (s.d. = 15). Higher scores indicate usage of the specific problem-solving approach regardless of its adaptive or maladaptive nature. Strong internal consistency (from 0.69 to 0.95), test–retest reliability (from 0.72 to 0.91), and concurrent validity have been reported (31, 32). In the present sample, the overall internal consistency coefficient across assessment points was 0.86. Internal consistency coefficients for the positive problem orientation, negative problem orientation, rational problem solving, avoidance style, and impulsivity/carelessness style subscales were 0.80, 0.88, 0.84, 0.89 and 0.83 respectively.

Analyses

To examine whether cognitive therapy contributed to improvements in problem-solving appraisal compared with EUC (i.e. the control condition), comparisons using repeated measures analysis of variance were conducted. Latent random effects variables for each participant using the hierarchical linear modeling offered by the SAS software version 8 (SAS Institute Inc., USA) were obtained to remain consistent with the type of analyses presented in Brown *et al.* (2005). This model allowed for an estimation of changes over time (at four time-points) using repeated measures without requiring last observation carried forward or exclusion of participants with missing follow-up data at one or more time-points. All models were based on a

MIXED procedure in SAS, where a linear model comparing means for each study condition over time was performed on each dependent variable controlling for baseline scores, with time and condition treated as fixed factors and subject as a random factor. The model assumes that repeated observations from the same subject are equally correlated. Baseline scores were not controlled for directly because pretreatment means were not significantly different between the two groups for any subscale. Instead, subject-specific random effects were estimated, which incorporated the baseline scores.

Results

Social problem-solving appraisal at baseline

Table 1 provides descriptive statistics on the five subscales of the Social Problem-Solving Inventory-Revised Short Form (D’Zurilla *et al.* 2002). Individuals with a recent suicide attempt compared with individuals on which the Social Problem Solving Inventory-Revised Short Form was normed (i.e. the normative sample) demonstrate lower scores on the positive problem orientation and rational style subscales. They demonstrate higher scores on the negative problem orientation as well as impulsivity/carelessness and avoidant style subscales.

Social problem-solving appraisal at follow-up

No significant between-group differences over time for cognitive therapy and EUC were noted on the Social Problem-Solving Inventory – Revised Short Form and its subscales. Significant within-group differences over time for both cognitive therapy and

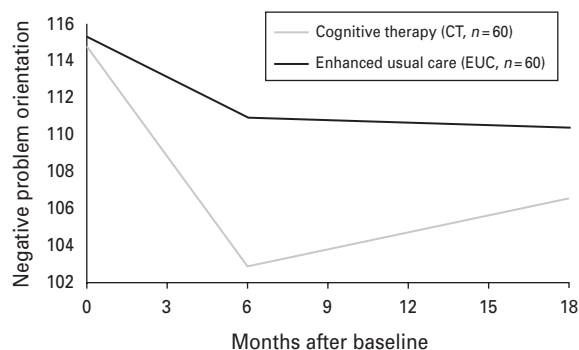


Fig. 1. Negative problem orientation change for the cognitive therapy (CT) and enhanced usual care groups. There was a significantly faster decrease within the first 6 months for the CT group ($F=5.46$, $df=1, 475$, $p=0.02$).

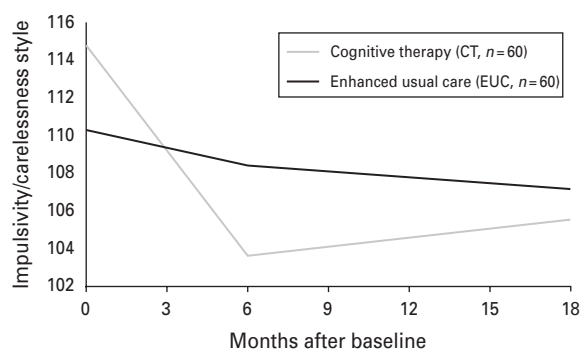


Fig. 2. Impulsivity/carelessness style change for the cognitive therapy (CT) and enhanced usual care groups. There was a significantly faster decrease within the first 6 months for the CT group ($F=7.17$, $df=1, 475$, $p=0.008$).

EUC were found for the total Social Problem-Solving Inventory-Revised Short Form score ($p<0.0001$), positive problem orientation ($p=0.009$), negative problem orientation ($p<0.0001$), impulsivity/carelessness ($p=0.002$) and avoidant ($p<0.0001$) styles.

Two subsequent analyses to specifically examine the pattern of between-group differences in the slope or the linear trend for change over time were subsequently performed. The initial series of analyses involved two separate models: (1) baseline to 6 months; (2) 6–18 months. The subsequent series of analyses involved a combined model using all of the data from baseline to 18 months but allowing the slope to change at 6 months. Results indicated that using a combined model significantly improved the fit of the model compared with the initial model, which produced a constant slope over 18 months. Given that the findings in both models were identical, only the results of the combined model are provided in this paper.

Baseline – 6 months linear trend for change in problem-solving appraisal

Results indicated a faster rate of change in negative problem orientation scores from baseline to 6 months for cognitive therapy ($M_{\text{baseline}}=114.85$; $M_{6\text{-months}}=102.95$) in comparison with EUC ($M_{\text{baseline}}=115.26$; $M_{6\text{-months}}=110.94$). The differential rate of change in negative problem orientation scores over the first 6-months was significant [$F(1, 475)=5.46$, $p=0.020$]. In addition, a faster rate of change in impulsivity scores from baseline to 6 months for cognitive therapy ($M_{\text{baseline}}=114.69$; $M_{6\text{-months}}=103.69$) in comparison with EUC ($M_{\text{baseline}}=110.25$; $M_{6\text{-months}}=108.43$) was observed. The differential rate of change in impulsivity scores over the first 6 months was significant [$F(1, 475)=7.17$, $p=0.008$]. Figs 1 and 2 illustrate

significant between-group differences in the slopes of the lines (i.e. the relative rates of change).

Quadratic and cubic polynomial regression models over time were additionally conducted. None of the quadratic and cubic interactions with treatment condition reached statistical significance leading us to conclude that the quadratic and cubic models did not significantly improve upon the fit obtained through the linear model. Finally, several covariance structures for the models, including allowing the slopes over time to vary randomly from subject to subject, were explored. Examination of fit indices (Akaike's Information Criterion and Bayesian Information Criterion) indicated that a model with a random subject-specific intercept was sufficient to describe the covariance structure of the data.

Correlational analyses

Correlations of change scores (Table 2) in the Social Problem-Solving Inventory – Revised Short Form total score and its subscales and change scores on the Beck Depression Inventory-II, the Beck Hopelessness Scale and the Scale for Suicide Ideation were obtained. All analyses were run for cognitive therapy using change scores observed from baseline to 6 months. Changes in problem-solving appraisal total score were negatively correlated with change scores on depression and hopelessness. More specifically, change scores on depression and hopelessness were positively correlated with negative problem orientation change scores and negatively correlated with rational style change scores. Furthermore, changes in hopelessness showed a robust negative correlation with positive problem orientation change scores, suggesting that improvements in one's positive problem orientation are associated with reductions in hopelessness.

Table 2. Intercorrelations of change scores (6 months – baseline) in the cognitive therapy condition for social problem-solving inventory scales and depression, hopelessness and suicide ideation ($n = 49$)

Variables	1	2	3	4	5	6	7	8	9
BDI	–								
BHS	0.44**	–							
SSI	0.23	0.26	–						
PPO	–0.25	–0.46**	–0.02	–					
NPO	0.53**	0.35*	0.10	0.08	–				
RPS	–0.30*	–0.37**	0.17	0.71**	–0.15	–			
ICS	0.15	0.07	–0.04	0.30*	0.60*	0.04	–		
AS	0.23	0.22	–0.06	0.32*	0.56*	0.07	0.75**	–	
SPSI-R:S	–0.49**	–0.49**	–0.05	0.32*	0.75**	0.57**	–0.68**	–0.66**	–

BDI, Beck Depression Inventory; BHS, Beck Hopelessness Scale; SSI, Scale for Suicide Ideation; PPO, positive problem orientation; NPO, negative problem orientation; RPS, rational problem solving; ICS, impulsivity/carelessness style; AS, avoidance style; SPSI-R:S, Social Problem Solving Inventory – Revised Short Form.

* $p < 0.05$, ** $p < 0.01$ (two-tailed).

Discussion

The first contribution of this study is to provide information on problem-solving appraisal of adults shortly after a suicide attempt. Individuals with a recent suicide attempt compared with non-suicidal individuals demonstrated lower scores on positive problem orientation and rational problem-solving style and higher scores on negative problem orientation, impulsivity/carelessness and avoidant problem-solving styles. These findings are consistent with existing literature, which highlights that individuals with suicide-related behaviors have a negative attitude or orientation toward their problems (Linehan *et al.* 1987; Schotte & Clum, 1987; Sadowski & Kelley, 1993; Pollock & Williams, 2001; Howat & Davidson, 2002). Once faced with life challenges, these individuals feel threatened, demonstrate low self-efficacy and have difficulty using a rational problem-solving approach that involves generating alternative solutions. For instance, individuals with suicide ideation compared with controls focus more on potentially negative outcomes of their problem-solving efforts and therefore are self-inhibited in actively implementing proposed alternatives to problems (Schotte & Clum, 1982, 1987). Further, those who attempt suicide either avoid problems or look for assistance from others; both strategies may adversely impact the problem-solving process (Sadowski & Kelley, 1993).

The second contribution of this study is related to a better understanding of the amount and types of changes in problem-solving appraisal for individuals who received targeted suicide prevention treatment *versus* those who did not over a highly sensitive time period of 6 months post-suicide attempt. Significant within-group differences over a 6-month period, for

both groups, were found for total problem-solving score, positive problem orientation, negative problem orientation, as well as impulsivity/carelessness and avoidant styles. Problem-solving appraisal appears impaired around the time of a suicide attempt but improves in the months following the attempt regardless of treatment. Previous literature has indicated no improvements in problem-solving (despite changes in depression, hopelessness and suicide ideation) among individuals followed up after a suicide attempt (Pollock & Williams, 2004). Contradictory findings as seen here may be potentially attributable to the differential number of participants in these studies (24 participants in cited study *versus* 120 participants in the current study). Further research in this area is warranted.

Third, cognitive therapy appears to prevent subsequent suicide attempts in the context of changes in problem-solving appraisal and psychological risk factors for suicide. Correlational analyses for the 6-month follow-up period show that favorable changes in problem-solving appraisal were associated with favorable changes in depression and hopelessness. These findings are in accord with existing literature, which highlights the association between self-appraised, ineffective problem-solving with hopelessness (Dixon *et al.* 1991; Rudd *et al.* 1994). Clinically, since favorable changes in positive problem orientation and negative problem orientation are both associated with changes in hopelessness, treatment for individuals who have attempted suicide should pay particular attention to reducing hopelessness and increasing self-efficacy as well as an adaptive approach to problem solving.

Finally, the most significant contribution of the present study is related to its demonstration that

cognitive therapy for the prevention of suicide is associated with several changes in problem-solving appraisal over the 6-month period following a suicide attempt. Analyses indicated a significantly faster rate of change, over the course of 6 months post-attempt, in negative problem orientation and impulsivity/carelessness problem-solving style for cognitive therapy compared with control. These results are of important clinical value. Much of the existing literature has demonstrated that the risk for a subsequent suicide attempt is at its highest within 3 to 6 months of the index attempt (Hawton & Fagg, 1988; Goldacre *et al.* 1993; Ho, 2003; Cooper *et al.* 2005). If a brief targeted intervention can markedly speed up the rate of change in problem solving so that an individual who has attempted suicide can sooner than later tackle his or her life problems in a more effective and rational manner, the subsequent likelihood of recurrence for suicide-related behaviors can be expected to diminish.

The significant change in negative problem orientation and impulsivity/carelessness style is supported by the theoretical rationale for cognitive therapy. Given that hopelessness is commonly observed in individuals who attempt suicide, cognitive therapy aims to instill hope by helping patients restructure cognitions about the nature of their problems and whether or not they are capable to effectively approach (not necessarily solve) them. Rapid changes in negative problem orientation are conceptualized as relating to one's increased sense of self-efficacy and hopefulness about addressing a problem. Another goal of cognitive therapy for the prevention of suicide is to help patients procrastinate suicide by identifying ways in which a life problem may be solved without relying on the single option of suicide. Cognitive therapy teaches suicidal patients to cope with adversities by learning about effective steps to adaptive problem solving. With these tools, suicidal individuals are expected to work through a problem rationally instead of impulsively. Future dismantling research on cognitive therapy for the prevention of suicide may provide information about the elements of treatment that are associated with observed changes in problem-solving appraisal. The two scales that changed significantly (i.e. negative problem orientation and impulsivity/carelessness style) in this study may serve as key areas of focus for future investigations.

A major strength of this study is related to the longitudinal nature of the data, which allowed for a thorough analysis of changes over time in problem-solving appraisal of individuals following their index suicide attempt. In addition, observations in relation to changes in problem-solving orientation and style were tracked over time in the context of a controlled research design set-up to evaluate the efficacy of

cognitive therapy for the prevention of suicide. However, a number of limitations exist and should be carefully considered when evaluating the study. Due to the time and ethical constraints associated with the administration of a long assessment battery to patients following a recent suicide attempt, data are only available on one self-report measure of perceived problem solving, a shortened version of Social Problem-Solving Inventory-Revised. Future studies, if feasible, may include additional measures of problem solving (Platt *et al.* 1971; Heppner & Petersen, 1988) to allow for a more comprehensive and suicide-focused assessment of the construct.

The current study was designed to specifically examine whether changes in problem-solving appraisal occurred at a significantly faster rate in the cognitive therapy group compared with the control group. Future studies that employ mediational and moderational analyses to examine the relationship between problem-solving appraisal and the recurrence of suicide-related ideation and behaviors will contribute further to our theoretical understanding of the potential mechanisms of change for cognitive behavior therapy. One such study has been published recently (Becker-Weidman *et al.* 2010) and is based on a randomized controlled trial of 439 adolescents who participated in the Treatment for Adolescents with Depression Study. Results based on a 12-week follow-up indicate that avoidant problem-solving style was predictive of both depression severity and suicide ideation whereas impulsivity/carelessness style was only predictive of suicide ideation. Negative problem orientation and positive problem orientation served as moderators of cognitive behavioral treatment outcome. Our study focuses exclusively on the differential rate of change of problem-solving appraisal at follow-up for adults who had attempted suicide. Our findings support those reported earlier by Becker-Weidman and highlight the importance of negative problem orientation and impulsivity/carelessness problem-solving style in the recovery process of suicidal individuals.

Moreover, future studies may investigate whether changes in problem-solving appraisal following a suicide attempt are a function of one's history of suicide-related behaviors. For example, a group of investigators (Williams *et al.* 2005) have reported that, for patients with histories of depression and suicide-related behaviors, an improved mood did not precede improved problem solving. In other words, according to the differential activation theory (Lau *et al.* 2004), individuals with histories of suicide-related behaviors show a cognitive vulnerability to a ruminative response style – one that may characterize chronically impaired problem solving. Of course, such

vulnerability may be biological as well. Therefore, the findings presented here also have potential implications for the study of endophenotypes in individuals who attempt suicide. For instance, there is evidence to suggest that disadvantageous decision making is associated with reported genetic polymorphisms, including the serotonin transporter promoter variant (5-HTTLPR), tryptophan hydroxylase 1 and monoamine oxidase A (Courtet *et al.* 2011). Cognitive therapy may, in fact, be associated with changes in underlying pathophysiology.

The current study describes an evaluation of changes in problem-solving appraisals in relation to the recurrence of suicide-related behaviors among individuals who were recruited for a psychotherapy, randomized controlled trial due to a recent suicide attempt. This study addresses a gap in the scientific literature as described by previous researchers (DeRubeis *et al.* 1990) and contributes to the scientific understanding of therapeutic changes associated with cognitive therapy in relation to improved problem solving. Favorable changes in a person's motivational stance to problems as well as reductions in an impulsive style of approaching problems appear to occur at a faster rate in individuals who receive cognitive therapy and may partially explain the treatment's contribution to suicide prevention.

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Declaration of Interest

None.

Note

- ¹ Cognitive therapy consisted of both cognitive and behavioral strategies. The authors are using the name assigned to the intervention as described in the original Brown *et al.* (2005) study.

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