

Research paper

Entrapment and social problem-solving in suicidal behavior across the adult lifespan

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ABSTRACT

Background: Feelings of entrapment and deficits in social problem-solving skills have been associated with risk for suicidal behavior in the context of depression. However, few studies have examined the effect of age on the association between these risk factors and suicidal behavior across most of the adult lifespan.

Methods: In a three-site study, we tested interactions of age with feelings of entrapment and social problem-solving style in 105 depressed patients with a recent suicide attempt, 95 depressed patients with no history of suicide attempt, and 97 demographically similar non-psychiatric participants (age 16–80). Attempter/non-attempter differences, age interactions, and the relative contribution of entrapment and social problem-solving style to past attempter were examined.

Results: Entrapment significantly interacted with age such that it discriminated past attempters from depressed non-attempters better at older ages. Social Problem-Solving Inventory (SPSI) total score and most subscales did not distinguish past attempters, but the SPSI Impulsive Style Problem-Solving was an effective discriminator of past suicide attempts across the full adult lifespan and did not interact with age. In a multipredictor model, both the entrapment by age interaction and SPSI Impulsive Style Problem-Solving score were significant predictors for the classification of attempters.

Limitations: The cross-sectional nature of our research design limited conclusions that may be drawn about individual change over time or cohort effects.

Conclusions: Entrapment did not distinguish past attempters at younger ages but became a better discriminator in middle to late adulthood. An impulsive problem-solving style was associated with past suicide attempts across the full adult lifespan.

1. Introduction

Entrapment is a key concept in multiple theories of suicide (Klonsky and May, 2015; O'Connor and Kirtley, 2018; Williams and Mark, 1997). It is hypothesized to contribute to suicidal ideation as a consequence of aversive environmental experiences (e.g., abusive relationships, and financial hardship) and negative psychological states (e.g., negative self-appraisal, status loss, loneliness). Entrapment refers to hindered defensive behaviors when immediate escape is not possible in high-risk circumstances (Dixon, 1998), which has been found to increase tonic

arousal in studies across species. Defensive behaviors such as averted gaze, minimal facial expressions, and disengagement from surroundings have been found in human subjects in stressful situations when escape is prevented (Taylor et al., 2011a, 2011b). Chronic feelings of entrapment are associated with the development of both depressive symptoms and suicidal behavior (O'Connor and Portzky, 2018). Feelings of entrapment may arise from both external (events, circumstances) and internal (thoughts, emotions) factors, and are incorporated in standard assessments of this construct (Gilbert and Allan, 1998).

The Integrated Motivational-Volitional (IMV) model of suicidal

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behavior states that perceived deficits in social problem-solving ability may lead to enhanced feelings of entrapment after experiences of defeat, which in turn predispose individuals to suicidal behavior (O'Connor and Kirtley, 2018). Social problem-solving (SPS) refers to an individual's attempt to identify, solve and cope with problems in daily life through self-generated processes involving cognitive, affective, and behavioral strategies (Chang et al., 2004). Five dimensions of SPS have been proposed (Chang et al., 2004): *positive problem orientation* refers to an individual's efficacy in solving social challenges and their willingness to commit time and effort to generate solutions; *negative problem orientation* refers to an individual's perception of challenges as threatening and unsolvable, as well as the propensity to feel frustrated and upset when confronted with such challenges; *rational problem-solving* relates to an individual's perceived ability to solve social issues in a rational, effective and systematic manner; *impulsive style problem-solving* refers to acting in a hastened and incomplete manner without extensive deliberation; lastly, *avoidant style problem-solving* refers to avoiding problems altogether (Chang et al., 2004).

Both entrapment and maladaptive SPS styles (negative, impulsive, avoidant) are associated with various psychological disorders and increased risk of suicidal ideation and suicidal behaviors, across diagnoses (Carvalho et al., 2013; Chang, 2002; Lau et al., 2019; Panagioti et al., 2013; Romano et al., 2019; Thoma et al., 2013, 2015). There is accumulating evidence for an association between entrapment and suicidal ideation and suicide attempts (O'Connor and Portzky, 2018; Siddaway et al., 2015; Taylor et al., 2011a, 2011b). Empirical support for the relationships between perceived maladaptive SPS and an increase in suicide risk has also been shown in various populations such as adolescents, inpatient participants, military personnel, and college students (Arie et al., 2008; Chang, 2002; Chu et al., 2018; Taylor et al., 2010a, 2010b).

Precipitants of suicide attempts tend to change with age. Not surprisingly, the frequency of specific types of life-events change across the life-cycle. Problems with family/romantic partners, and issues at school tend to precipitate suicide attempts among adolescents; whereas middle adults reported marital/job loss as major predictors, and older adults indicated that medical comorbidities, hopelessness and social isolation as major negative life events prior to suicide attempt (Choo et al., 2018; Fernandez-Rodriguez et al., 2022; Steele et al., 2018). Different precipitants may also be associated with different psychological risk factors for suicide attempts across the lifespan. Feelings of entrapment and worsening SPS could emerge at various stages in one's life due to different life events, age-related cognitive changes, or worsening depression. The relevance of entrapment and SPS could change across the lifespan on suicidal behavior for these reasons.

Most entrapment and suicide research has focused on adolescents and younger adults (O'Connor and Portzky, 2018; Park et al., 2010). This is true as well for research on SPS and suicide risk (Arie et al., 2008; Chu et al., 2018; Taylor et al., 2010a, 2010b). In addition, many studies used samples that included individuals with mixed samples of suicide attempters and non-suicidal self-injurious behavior, low levels of suicidal ideation, and used less well-validated scales to measure entrapment. Although the IMV model characterizes the role of social problem-solving and entrapment in suicide ideation and behavior as one of potential cause and effect, no research to date has empirically tested this proposed relationship, nor how this relationship may change across the adult lifespan.

One study in a sample of young adults (aged 18 to 34) investigated how entrapment changes with age (Cramer et al., 2019). In this study age was negatively correlated with entrapment. However, the age range of the sample was restricted to late adolescence through early adulthood. There is a larger body of research on age-related changes in problem-solving. Maladaptive SPS styles tend to decrease with age, whereas adaptive social problem-solving styles tend to increase (Strough and Berg, 2011), consistent with theories suggesting that older individuals tend to focus more on positive emotions (Carstensen et al., 1999). We

hypothesized, therefore, that a) feelings of entrapment and negative aspects of social problem-solving in depressed individuals would decrease with age and b) would be less effective in discriminating older depressed patients.

2. Methods

2.1. Sample

Three hundred and nine participants aged 16–80 (*mean* = 43.31, *SD* = 17.90; 62.46 % female) were recruited from three medical centers in Columbus, OH, Pittsburgh, PA, and New York City, NY as part of a multi-center project to examine neurocognitive and psychological risk factors for suicidal behaviors across the lifespan (Buerke et al., 2021). Two hundred ninety-seven participants who completed measures on entrapment and SPS were included in this analysis. Participants included three groups: depressed suicide attempters (ATT; *N* = 105), depressed non-attempters (NATT; *N* = 95), and a non-psychiatric healthy comparison group (HC; *N* = 97). All depressed participants (NATT and ATT) met the criteria for current major depressive disorder (MDD), without psychosis, at the time of study enrollment, with a score of 14 or higher on the 17-item Hamilton Depression Rating Scale (HDRS-17; Hamilton, 1960). The attempter group had a history of at least one suicide attempt within five years of study enrollment. Suicide attempt was defined as self-injurious behavior with stated or inferred intent to die (O'Carroll et al., 1996). The depressed non-attempter group had no history of suicide attempts, though current or past suicidal ideation was permitted. The healthy comparison group had no history of psychiatric illness or substance abuse.

Individuals with a history of neurological disorders, mania, psychosis, or dementia were excluded from the study. Additional exclusion criteria included a score <24 on the Mini-Mental State Examination (MMSE; Folstein et al., 1975a, 1975b) or undergoing electroconvulsive therapy within the past 6 months. Individuals with current substance use disorder were excluded, though a history of abuse was allowed with remission for at least three months before study enrollment.

2.2. Instruments

2.2.1. Entrapment

Entrapment was assessed using the 16-item Entrapment Scale (Gilbert and Allan, 1998). Responses to the items are 5-point Likert scales (0= "not at all like me", 1= "a bit like me", 2= "moderately like me", 3= "quite a bit like me", 4= "extremely like me"). The total score ranges from 0 to 70 with a higher score indicating a higher level of feelings of entrapment.

2.2.2. Social Problem-Solving

Social Problem-Solving Inventory (SPSI) is a 25-item, multidimensional self-report survey that measures problem-solving styles in social contexts. Respondents were to choose from a 5-point Likert scale (0= "not at all true of me", 1= "slightly true of me", 2= "moderately true of me", 3= "very true of me", 4= "extremely true of me"). Five dimensions are assessed in subscales, namely Positive Problem-Solving Orientation, Negative Problem-Solving Orientation, Rational Problem-Solving, Impulsive Style, and Avoidant Style. Scores for each construct and the total of all scales can be computed. Scores on Positive Problem-Solving Orientation and Rational Problem-Solving, as well as the SPSI Total, are positively scaled and higher scores indicate better social problem-solving abilities. In the computation of the SPSI Total score, scores on Negative Problem Orientation, Impulsive Style, and Avoidant Style, which are negatively scaled, are reverse weighted.

2.2.3. Suicide history

Suicide attempt history was assessed with the Columbia Suicide History Form (Oquendo et al., 2003) and verified using participant

reports, medical records, and corroboration from family and friends when available. The medical seriousness of both the most lethal and most recent suicide attempts was characterized using the Beck Lethality Scale (BLS; Beck et al., 1975). The subjective intent, seriousness, and planning involved in both the most lethal and most recent attempts were characterized using the Suicidal Intent Scale (SIS; Beck et al., 1974). Suicide ideation for the past week, as well as at the worst-ever lifetime was assessed using the 19-item Beck Scale of Suicide Ideation (SSI; Beck et al., 1979).

2.2.3.1. Depression severity. The Hamilton Depression Rating Scale (HDRS; Hamilton, 1960) was used to assess interviewer-rated depression severity. Self-reported depression severity was assessed using the Beck Depression Inventory (BDI; Beck and Steer, 1987). A comparison of core depression severity among groups was made using 16 items from the 17-item HRSD, excluding the suicide item (item #3) from analyses to avoid overinflating ATT participants' total scores.

2.2.4. Intellectual ability and mental status

An estimate of premorbid intellectual level was obtained using averaged age-adjusted scaled scores of the Vocabulary and Matrix Reasoning subtests of the Wechsler Adult Intelligence Scale, 4th edition (WAIS-IV; Wechsler, 2008), which are the best overall subtest correlates of full-scale IQ and resistant to the effects of depression (Gorlyn et al., 2006). Subjects' current mental status was assessed using the Folstein Mini-Mental State Examination (MMSE; Folstein et al., 1975a, 1975b).

2.3. Procedures

Participants were recruited via inpatient psychiatric units, outpatient clinics, advertisements, or primary care providers. Informed consent was obtained from all participants. All study procedures were approved by the University of Pittsburgh Institutional Review Board, Abigail Wexner Research Institute at Nationwide Children's Hospital Institutional Review Board, and the New York State Psychiatric Institute Institutional Review Board.

Participants' demographic, diagnostic, and clinical information were collected through structured interviews and self-reports. Psychological diagnoses included current or lifetime Axis I disorders, using the Structured Clinical Interview for DSM Disorders (SCID, First et al., 1995). Lifetime physical illness burden across 13 organ systems was evaluated using the Cumulative Illness Rating Scale (CIRS; Linn et al., 1968).

2.4. Analytic strategy

All scores were examined for outlying values prior to analyses, defined as 1.5 Inter-Quartile Ranges above the 75th or below the 25th percentile. All the outliers were attenuated to the nearest value within the non-outlier range.

Quantitative and categorical demographic and clinical descriptive measures were compared using either one-way analysis of variance or chi-square tests across three groups, followed by pairwise comparisons.

Healthy volunteer participants were included as a comparison group to illustrate normal age-related changes but were excluded from logistic regression analyses given that ATT vs. NATT differences on risk scores and their interaction with age were the focus of this study.

Pearson correlations were computed between age and Entrapment Scale scores and SPSI scores, and between Entrapment Scale score and SPSI scores, within all depressed patients.

Separate binomial logistic regression models were fit in the patient sample with attempter status as the outcome variable, and with age, candidate predictors, and the interaction between age and the candidate predictors as independent variables. The candidate predictors include the entrapment score, the total score of SPSI, and the subscales of SPSI,

and these were initially conducted separately. These analyses also covaried for depression severity, as measured by BDI. Statistical significance was set at $p < 0.05$, two-tailed for the two models. Bonferroni corrections were applied to the significance level for five SPSI subscales, setting significance cutoff for the subscales at $p < 0.01$.

In the last step of the analysis, candidate factors that showed differences between NATT and ATT groups in analyses of individual scales, including those that differed across the age spectrum as well as those that interacted with age, were entered as predictors into a single binomial logistic regression model. Age and all other predictors were centered for all the logistic regression models to interpret any significant main effects. All analyses were performed in R, version 4.0.2.

3. Results

3.1. Demographic and clinical characteristics

The demographic and clinical characteristics of the samples are presented in Table 1. No significant group differences were observed with respect to the distribution of the three groups across sites, age, sex, race, ethnicity, or estimated premorbid functioning. Both depressed groups reported a greater physical illness burden than healthy comparisons, but no difference was observed within the depressed groups. There were no differences between depressed groups in the presence of comorbid lifetime substance abuse or anxiety disorders. Attempters had the lowest level of education and the lowest estimated income, despite equivalent estimated premorbid ability. Attempters had a median of 2 (IQR:2) lifetime attempts. Their most lethal suicide attempt had high intent (mean SIS = 16.74, SD = 4.8) and mean lethality of 3.06 (SD = 2.24), equivalent to the need for some medical intervention as a consequence of their attempt.

Both depressed groups, relative to healthy volunteers, had significantly higher scores on the Entrapment Scale, SPSI Negative Problem-Solving Orientation, SPSI Avoidant Style, and SPSI Impulsive Style sub-scores, as well as lower SPSI Total, Positive Problem-Solving Orientation, and Rational Problem-Solving. Within depressed groups, however, only the SPSI Impulsive Style subscale was significantly higher among attempters compared to depressed non-attempters.

3.2. Correlations of risk factors with age

In the combined depressed groups, age was negatively correlated with Entrapment ($r = -0.26, p = 0.003$), SPSI Negative Problem Orientation ($r = -0.23, p = 0.009$), and Avoidant Style ($r = -0.25, p = 0.005$). Age was also marginally negatively correlated with Rational Problem-Solving ($r = -0.17, p = 0.018$) but with Bonferroni correction was nonsignificant. Correlations between age and the SPSI Total score ($r = 0.07, p = 0.31$), Positive Problem Orientation ($r = 0.05, p = 0.49$), and Impulsive Style ($r = -0.03, p = 0.72$) were non-significant.

3.3. Entrapment, social problem-solving, and suicide attempt

In the model examining Entrapment X Age interaction (Table 2a), the main effect of entrapment was not significant, but the interaction term was ($p = 0.047$), and the coefficients from the model provided evidence that the difference in entrapment between groups was greater for older ages. The BDI score as a covariate did not contribute significantly to this logistic model.

When testing SPSI Total with age, no independent variables were significant. When testing the subscales of SPSI with age, only the model examining SPSI Impulsive Style was significant, which indicated a significant main effect of Impulsive Style ($p = 0.006$) and a nonsignificant interaction effect ($p = 0.46$). For the model examining Negative Problem-Solving Orientation, the interaction variable (Negative Problem-Solving Orientation X age) was nominally significant ($p = 0.043$), however, significance did not survive the Bonferroni correction.

Table 1
Demographic and clinical characteristics by group.

	HC	NATT	ATT	p-Value	Pairwise comparison
n	97	95	105		
Site (%)				0.52	
NY	30 (31.0)	22 (23.2)	33 (31.4)		
OSU	29 (29.9)	38 (40.0)	33 (31.4)		
PITT	38 (39.2)	35 (36.8)	39 (37.1)		
Sex = female (%)	62 (63.3)	66 (65.3)	65 (59.1)	0.66	
Race (%)				ns	
Asian	5 (5.2)	3 (3.2)	7 (6.8)		
Black or African American	22 (22.7)	12 (12.6)	19 (18.5)		
White	66 (68.0)	70 (73.7)	58 (56.3)		
More than one race	1 (1.0)	5 (5.3)	13 (12.6)		
Other ^b	3 (3.1)	5 (5.3)	6 (5.8)		
Ethnicity (Hispanic or Latino %)	8 (8.3)	8 (8.4)	19 (18.1)	0.045	ns
Age	46.2 (18.6)	43.4 (18.6)	40.1 (16.7)	0.055	
Estimated premorbid ability ^a	11.7 (2.2)	11.9 (2.4)	11.3 (2.8)	0.20	
Education (years)	15.6 (2.2)	15.0 (2.6)	14.2 (2.3)	<0.001	ATT<NATT, HC
Income per capita	30 K (21 K)	23 K (21 K)	20 K (20 K)	<0.001	ATT<NATT<HC
Mental status exam (MMSE)	29.5 (0.8)	29.2 (1.0)	29.0 (1.2)	<0.001	ATT, NATT<HC
Physical illness burden (CIRSG)	3.0 (3.6)	5.8 (5.0)	5.7 (5.2)	<0.001	ATT, NATT>HC
Age of depression onset	–	27.1 (17.4)	21.9 (13.6)	0.022	ATT<NATT
HRSD (without suicide item)	1.8 (2.2)	17.3 (4.5)	18.4 (5.6)	<0.001	ATT, NATT>HC
HRSD (with suicide item)	1.8 (2.2)	18.2 (5.0)	20.2 (6.4)	<0.001	ATT>NATT>HC
Max attempt lethality	–	–	3.0 (2.2)		
Number of attempts	–	–	2.4 (2.3)		
Current ideation (SSI)	0.0 (0.0)	6.1 (9.7)	16.6 (11.7)	<0.001	ATT>NATT>HC
Worst-point ideation (SSI)	0.1 (0.5)	10.6 (11.3)	27.3 (4.6)	<0.001	ATT>NATT>HC
Entrapment scale total	1.7 (3.8)	30.4 (17.9)	34.9 (16.7)	<0.001	ATT, NATT>HC
Social problem-solving inventory total	73.7 (5.3)	62.9 (8.7)	60.5 (9.3)	<0.001	ATT, NATT<HC
Impulsive style problem-solving	2.7 (2.5)	4.9 (4.2)	6.7 (4.4)	<0.001	ATT>NATT>HC
Negative problem-solving orientation	2.1 (2.1)	8.9 (4.8)	9.7 (5.0)	<0.001	ATT, NATT>HC
Avoidant problem-solving	2.3 (2.0)	7.0 (4.7)	8.1 (5.2)	<0.001	ATT, NATT>HC
Positive problem-solving orientation	14.7 (3.2)	9.1 (4.7)	8.9 (4.8)	<0.001	ATT, NATT<HC
Rational problem-solving	12.9 (4.0)	9.7 (4.7)	9.2 (4.5)	<0.001	ns
Beck depression inventory total	2.0 (3.1)	23.3 (10.0)	26.8 (11.4)	<0.001	ATT>NATT>HC

^a Wechsler Adult Intelligence Scale, 4th revision Average Scaled Scores for Vocabulary and Matrix Reasoning. Legend: HC, healthy comparison; NATT,

depressed non-attempters; ATT, suicide attempters; ns = no significant pairwise comparison.

^b Other race group includes American Indian/Alaskan Native, Native Hawaiian or Other Pacific Islander and any other unspecified racial backgrounds

All other models examined were not statistically significant (Table 2). Age effects and interactions for significant models were illustrated in Fig. 1.

The final model (Table 3) included entrapment, age, the entrapment X age interaction, and ICS as independent variables, and suicide attempt as the outcome variable. ICS was significant ($p = 0.0043$) and the interaction between age and entrapment was also significant ($p = 0.018$).

4. Discussion

In this study, we investigated changes in the salience of psychological factors as predictors of suicide attempt among depressed adults across the adult lifespan. Entrapment and social problem-solving are proposed as key constructs related to suicide risk based on the literature (Gibbs et al., 2009; Taylor et al., 2010a; Taylor et al., 2010b; Taylor et al., 2011a, 2011b). Despite the proposed sequential and combined effect in suicide theories - impaired problem-solving and the hopelessness leading to feelings of entrapment (O'Connor and Kirtley, 2018) - no research has examined social problem-solving and entrapment together or has taken age into account to evaluate their relevance at different points in the lifespan. Consistent with our initial hypothesis, our results showed that feelings of entrapment, negative problem-solving, and avoidant problem-solving styles declined with age among depressed groups. Within the context of these age-related changes, we found significant interactions between age and entrapment in its ability to distinguish past suicide attempters across the lifespan, specifically that entrapment was a better discriminator in older adults than younger adults. This age interaction was contrary to our initial hypothesis, based on the presumption of an age-related decline in feelings of entrapment, that this scale might be a more effective discriminator of attempters at younger ages. Impulsive problem-solving style, by contrast, was unaffected by age and remained a consistent and significant discriminator of suicide attempters across the lifespan.

Entrapment has been shown to be correlated with anxiety disorders, post-traumatic stress disorder, depression, and suicidality with relatively large effect sizes (Siddaway et al., 2015; Taylor et al., 2010a, 2010b). Entrapment declined with age when examined in both depressed groups combined; however, this decline in entrapment was only significant among depressed non-attempters (see Fig. 1). In older adults, entrapment could be further exacerbated by ruminative thinking, which has been associated with biomarkers of dementia, neural aging, and suicidality (Buerke et al., 2021; Karim et al., 2021; Marchant et al., 2020). Entrapment may interact with rumination to exacerbate suicide ideation (Li et al., 2018; Schuck et al., 2019; Teismann and Forkmann, 2017).

Our study found that, as expected, healthy volunteers had the highest level of positive and rational problem-solving styles, and the lowest level of impulsive, avoidant, and negative problem-solving styles. Among the depressed groups, however, only the measure of impulsive problem-solving style distinguished the attempter group. Our findings are consistent with the extant literature, which found that suicide attempters perceive their problem-solving skills as dysfunctional and maladaptive and their problem-solving styles as more impulsive, in both older and younger populations (Dixon et al., 1991; Gibbs et al., 2009; Rudd et al., 1994; Schotte and Clum, 1987). Previous studies have also typically found higher behavioral impulsivity in suicide attempters when performing cognitive tasks (Albanese et al., 2019; Harfmann et al., 2019; Jollant et al., 2007; Keilp et al., 2013; Richard-Devantoy et al., 2014; Wu et al., 2009). However, recent studies on mood-related trait impulsivity find it to be a better predictor of suicidal ideation, than of

Table 2
Entrapment, SPSI total, and SPSI subscales in depression predicting suicide risk across the lifespan.

Variables	Estimate	Standard Error	Z value	P value	Confidence interval	
2a. Entrapment predicting suicide risk across the lifespan ($p = 0.034^*$)						
Intercept	0.17	0.15	1.14	0.26	-0.12	0.47
Entrapment	0.0023	0.012	0.20	0.85	-0.021	0.026
Age	-0.0039	0.0088	-0.45	0.66	-0.021	-0.013
Age*entrapment	0.0010	0.00052	1.99	0.047*	0.000031	0.0021
BDI	0.029	0.019	1.51	0.13	-0.0082	0.067
2b. SPSI total predicting suicide risk across the lifespan ($p = 0.16$)						
Intercept	0.091	0.15	0.63	0.53	-0.19	0.38
SPSI total	-0.028	0.016	-1.73	0.083	-0.061	0.0033
Age	-0.011	0.0084	-1.29	0.20	-0.027	0.0056
Age*SPSI total	-0.00024	0.0010	-0.25	0.81	-0.0022	0.0017
2c. SPSI impulsive style predicting suicide risk across the lifespan ($p = 0.011^*$)						
Intercept	0.095	0.15	1.65	0.52	-0.19	0.39
Impulsive style	0.096	0.035	2.73	0.0064**	0.028	0.17
Age	-0.013	0.0085	-1.47	0.14	-0.030	-0.0041
Age*impulsive style	0.0015	0.0020	-0.75	0.46	0.0054	0.0024
2d. SPSI avoidant style predicting suicide risk across the lifespan ($p = 0.25$)						
Intercept	0.12	0.15	0.79	0.43	-0.17	0.41
Avoidant style	0.044	0.032	1.38	0.17	-0.018	0.11
Age	-0.0088	0.0086	-1.02	0.31	-0.026	0.0081
Age*avoidant style	0.0014	0.0019	0.73	0.46	-0.0023	0.0052
2e. SPSI positive problem orientation predicting suicide risk across the lifespan ($p = 0.40$)						
Intercept	0.094	0.14	0.65	0.51	-0.19	0.38
Positive problem orientation	-0.010	0.031	-0.22	0.83	-0.067	0.054
Age	-0.011	0.0084	-1.35	0.18	-0.028	0.010
Age*positive problem orientation	-0.0018	0.0019	-0.91	0.36	-0.010	0.0020
2f. SPSI negative problem orientation predicting suicide risk across the lifespan ($p = 0.074$)						
Intercept	0.17	0.15	1.11	0.27	-0.13	0.47
Negative problem orientation	0.038	0.032	1.20	0.23	-0.024	0.10
Age	-0.0072	0.0088	-0.83	0.41	-0.025	0.010
Age*negative problem orientation	0.0041	0.0020	2.02	0.043*	0.00018	0.010
2g. SPSI rational problem-solving on predicting suicide risk across the lifespan ($p = 0.31$)						
Intercept	0.10	0.15	0.70	0.48	-0.18	0.39
Rational problem-solving	-0.033	0.032	-1.05	0.30	-0.097	0.029
Age	-0.013	0.0085	-1.57	0.12	-0.030	0.0032
Age*rational problem-solving	0.0011	0.0019	0.58	0.56	-0.0026	0.0049

the attempt itself (Klonsky and May, 2010; Klonsky et al., 2017; May and Klonsky, 2016). Self-perceived impulsive problem-solving, however, may be a narrower concept focused on how an individual approaches social problems, rather than a more global propensity to behave impulsively in most situations. Coping abilities appear to have a direct association not only to suicidal behaviors, but to the degree of suicide intent, which typically impacts the severity of suicidal behavior. Prior studies have found that coping with both physical illness burden and financial problems was a significant predictor for both suicidal behavior and suicide intent. Regret over failures of coping was found to predict suicide intent in a diverse age group (Burón et al., 2016; Choo et al., 2019; Stone et al., 2016).

The Integrated Motivational-Volitional Model posits that entrapment emerges from failures in social problem-solving and other coping deficits and leads to the development of suicidal thinking and behaviors. While a longitudinal design could better address the temporal sequence of these psychological processes, our cross-sectional data suggest that entrapment and impulsive problem-solving style contribute independently to suicide risk. Correlation between the Entrapment scale and the SPSI Impulsive Style subscale was moderate ($r = 0.30, p < 0.001$) among depressed patients; the Entrapment score was more strongly associated with Negative Problem-Solving Orientation ($r = 0.54, p < 0.001$) and Avoidant Style ($r = 0.43, p < 0.001$). Other aspects of social problem-

solving may be more strongly associated with entrapment.

Feelings of entrapment may emerge from the pervasive and systematic negative bias in information processing in perception, problem-solving, reasoning that is characteristic of depressive disorders. Dysfunctional attitudes toward oneself and your surroundings are also likely to contribute to feelings of entrapment and to rumination over negative experience, feelings, and thoughts (Beck, 1963; Siddaway et al., 2015; Taylor et al., 2011a, 2011b). Both depression and dysfunctional attitudes are associated with a lower quality of life (QOL) physically and mentally compared to the general population (Pyne et al., 1997). The ability to manage depressive symptoms, in turn, was found to be a significant mediator of the association between dysfunctional attitudes and both physical and mental QOL. Healthier problem-focused coping style was a significant mediator between dysfunctional attitudes and physical QOL (Tan et al., 2015).

Findings presented here, as well as data previously published from this study (Buerke et al., 2021), suggest that aging has widespread effects on numerous risk factors for suicidal behavior, but that age-related changes can both enhance, detract from, or not affect the potency of these risk factors. Generalizations about the relevance of certain risk factors for suicidal behavior derived from patient populations within a narrow age range can be misleading and must be subject to empirical testing in broader age samples. Certain risk factors (Franklin et al., 2017;

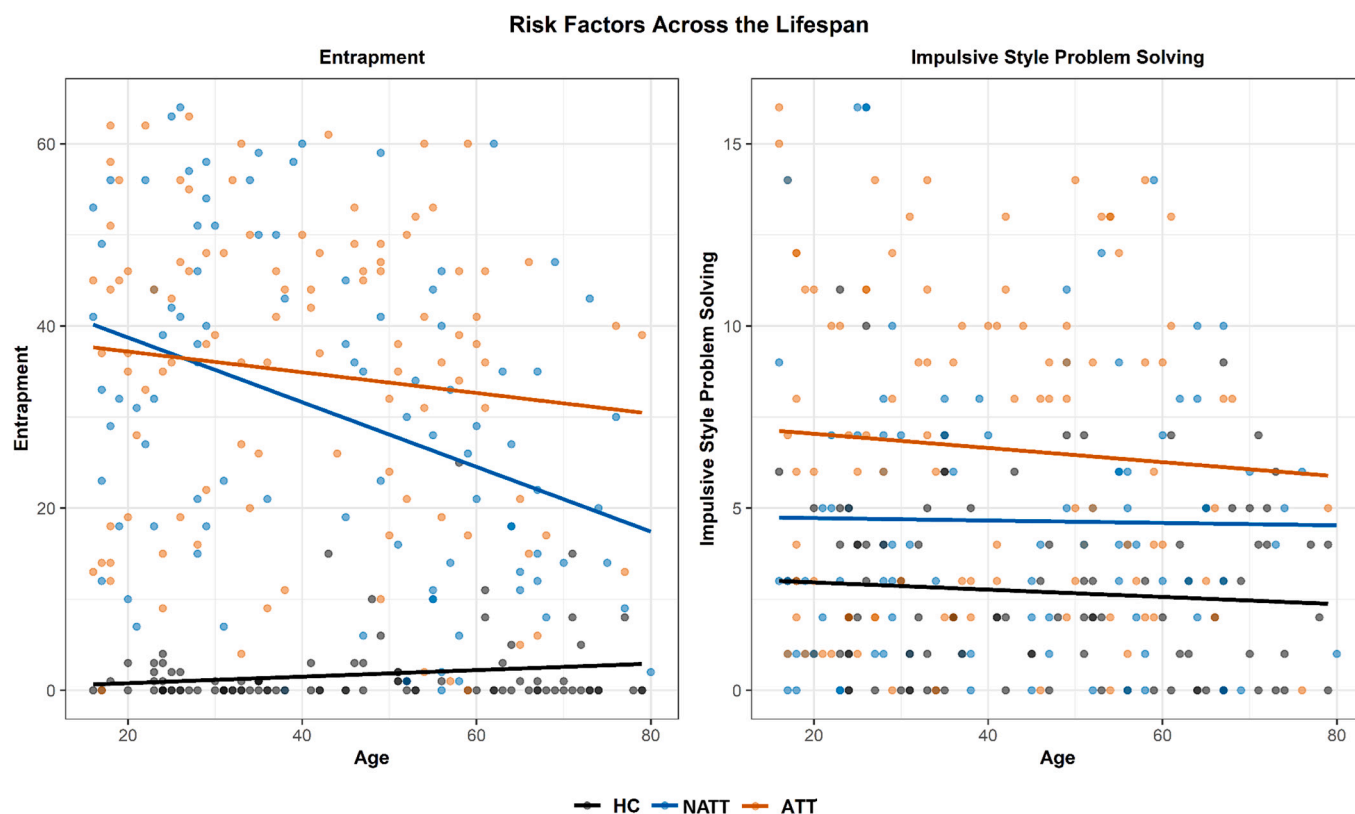


Fig. 1. Entrapment and impulsive problem-solving style for suicidal behavior across the lifespan. Legend: HC, Healthy comparison; NATT, Depressed non-attempters; ATT, Depressed suicide attempters.

Table 3

A logistic regression model including all significant candidate predictors of suicide risk across the lifespan ($p = 0.002^{**}$).

Variables	Estimate	Standard error	Z value	P value	Confidence interval
Intercept	1.72	0.15	1.11	0.27	−0.13 0.48
Entrapment	0.0070	0.0095	0.74	0.46	−0.12 0.026
Age	−0.0069	0.0090	−0.77	0.44	−0.025 0.011
Age*entrapment	0.0013	0.00055	2.37	0.018*	0.0002 0.0024
Impulsive style (SPSI)	0.11	0.038	2.86	0.0043**	0.035 0.18

Gili et al., 2019; Qin et al., 2022) are likely to remain relevant across the adult age span (Buerke et al., 2021; Gujral et al., 2016; Kenneally et al., 2019) developmental effects on both the risk factors themselves and on their discriminating power need to be a focus of future study.

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CRedit authorship contribution statement

Chenyang Wang wrote the initial paper draft and conducted analyses with Hanga Galfalvy and John Keilp. Katalin Szanto, John Keilp, and Jeffrey Bridge designed the study, wrote the protocol, supervised the project, and edited the manuscript. Arielle Sheftall conducted data collection at the Columbus site and edited the manuscript.

Declaration of competing interest

This current study declares no conflict of interest.

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