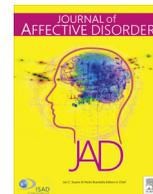




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Research paper

An investigation of persistence through pain and distress as an amplifier of the relationship between suicidal ideation and suicidal behavior



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ARTICLE INFO

Article history:

Received 20 December 2015

Received in revised form

25 January 2016

Accepted 13 February 2016

Available online 17 February 2016

Keywords:

Suicide

Suicidal ideation

Distress tolerance

Acquired capability

ABSTRACT

Recent research has emphasized the importance of examining factors that strengthen the association between suicidal ideation and suicidal behavior, thereby aiding in the transition from thought to action. Theoretical and empirical work has demonstrated that suicidal desire is more strongly associated with suicidal behavior among individuals better able to tolerate distressing sensations, consistent with the notion that suicidal behavior is difficult and aversive and requires a capability to overcome otherwise daunting obstacles. Participants were 100 adults, recruited from the community, in part based upon their prior history of suicidal behavior. Each participant took part in a behavioral task during which both emotional distress and physical pain were induced. Participants were told that persistence through the end of the task would result in the ability to opt out of all but five minutes of the remaining protocol, whereas early cessation of the task would result in the administration of the entire protocol. Results indicated the relationship between current suicidal thoughts and lifetime attempts was significant only at mean and high levels of task persistence. Our results provide novel behavioral support for the importance of persistence through pain and distress in suicidal behavior.

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In recent years, there has been a movement within Suicidology to consider suicide risk within the context of an “ideation to action” framework (Klonsky and May, 2014). This movement stems from the well-known but poorly understood fact that the majority of individuals who think about suicide never attempt and the majority of those who attempt do not die by suicide (Goldsmith et al., 2002; Nock et al., 2008). As such, the emphasis has shifted to models that help clarify factors that increase the strength of the association between thinking about suicide and actually engaging in suicide attempts.

Theoretical frameworks such as the interpersonal psychological theory of suicidal behavior (IPTS; Joiner, 2005) and the Three-Step Theory of Suicide (3ST; Klonsky and May, 2015) argue that the primary factor that enhances the association between thought and action is a capability for suicide. These theorists argue that, without the capability-comprised of a heightened tolerance of physiological pain, a diminished fear of death and bodily harm, and access to and familiarity with lethal means – suicidal desire will not result in a suicide attempt. The rationale for the capability

for suicide as a vital component of the association between thought and action is that suicide attempts are both emotionally and physically challenging. Emotionally, suicide attempts require an individual to overcome the drive for self-preservation and the fear that typically accompanies the possibility of impending death. Physically, suicide attempts require an individual overcome pain, discomfort, or at least the threat of one or both of those aversive sensations. In this sense, suicide attempts necessitate that individuals prioritize the pursuit of death over the escape from acute aversive affective and physiological states (Anestis et al., 2014a). Indeed, researchers have posited that this requirement helps explain recent data indicating that variables such as impulsivity and emotion dysregulation are strongly associated with suicidal ideation, but only weakly and indirectly associated with suicidal behavior (Anestis et al., 2014b; Law et al., 2015).

A number of studies have supported the importance of the capability for suicide in enhancing the association between suicidal desire and suicidal behavior (e.g., Anestis et al., 2015; Joiner, 2005), but these studies have largely relied upon self-report and interview data. Mounting evidence suggests that self-report and behavioral measures of constructs related to the ability to persist amidst emotional and physical distress (e.g., distress tolerance) do not correlate with one another (e.g., Bernstein et al., 2011) and, as such, it is unclear to what extent prior work has truly been able to

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capture certain aspects of the capability for suicide. Specifically, no prior work has examined the extent to which suicidal ideation is more strongly associated with suicidal behavior among individuals willing to persist amidst pain and distress in pursuit of an end.

To address this void in the literature, we designed an enhanced version of existing behavioral paradigms, in which we aimed to mirror an important aspect of the decisional balance involved in suicidal behavior. A sample of adults drawn from the community and recruited in part based upon their prior history of suicide attempts was invited into a laboratory setting. During the behavioral paradigm, the participants took part in a card-sorting based distress tolerance task while 90% of their baseline pain tolerance was continuously administered. Participants were told that persistence to the end of the task would allow them to opt out of all but 5 min of the remaining protocol, whereas quitting prior to the end would result in participation in the remaining 20 min. To our knowledge, no prior studies have combined persistence through physical pain and emotional distress in a single test, a vital hole in the literature given the role of distress and pain in the conceptualization of the capability for suicide.

We hypothesized that the relationship between current suicidal thoughts and lifetime suicide attempts would be moderated by task persistence, such that the relationship would increase in magnitude as persistence amidst pain and distress increased. Results consistent with our hypothesis would represent the first preliminary behavioral support for the role of capability in understanding vulnerability to suicidal ideation alone; as opposed to vulnerability to suicidal ideation along with suicidal behavior. Such results would also highlight an important component of the decisional balance involved in suicidal behavior that may distinguish it from similar behaviors (e.g. non-suicidal self-injury) often used to escape acute aversive sensations: the willingness push through pain and distress in pursuit of a long term end.

1. Method

1.1. Participants

Participants were 100 adults (76.0% female; $M_{age}=23.63$; age range: 18–60) recruited from the greater Hattiesburg, Mississippi area. Recruitment efforts included messages on listservs and message boards and fliers placed in public locations and health care facilities throughout the community. In an effort to recruit a greater number of individuals with prior suicide attempts, several recruitment materials specifically asked for individuals with at least one prior attempt. In total, 44.0% of participants identified as Black, 40.0% as White, 10.0% as Asian/Pacific Islander, and 6.0% as Other. The majority (62.0%) reported a total annual family income of \$50,000 or less. Additionally, 14.0% of the sample identified as a sexual minority.

2. Measures

2.1. Self-report questionnaires

Suicidal ideation was assessed using the Depressive Symptom Index – Suicidality Subscale (DSI-SS; [Metalsky and Joiner, 1997](#)). The DSI-SS consists of four items assessing the extent to which participants are currently experiencing thoughts and urges related to suicide and the extent to which they have engaged in suicidal plans and preparations. Items are scored on a 0–3 scale, with higher scores representing greater levels of risk. The DSI-SS has previously exhibited strong psychometric properties ([Joiner et al., 2002](#)) and the alpha coefficient in this sample was .91.

2.2. Structured interview

Lifetime suicide attempts were assessed using the Lifetime Suicide Attempts Self-Injury Interview (L-SASI; [Linehan and Comtois, 1996](#)). The L-SASI assesses lifetime incidents of both non-suicidal self-injury and suicide attempts. For each self-injurious behavior, the L-SASI assesses the participant's intent to die (none, ambiguous, clear intent to die), type of medical attention received (if any), and level of lethality. Only behaviors involving clear or ambiguous intent to die were included in our variable representing lifetime suicide attempts.

2.3. Behavioral tasks

Physiological pain tolerance was assessed through the use of a Wagner FPIX 25 pressure algometer. The algometer was applied just below the knuckle on the bony portion of the second finger of the right hand on all participants. An initial pressure level of one pound of force was applied and this was increased by one pound every five seconds. The algometer was used at two separate points in the protocol: a baseline pain tolerance assessment and as a component of the experimental portion (described below). For the baseline pain tolerance task, the participant was told to say “pain” when the pressure was first experienced as pain. This constituted a measure of pain threshold. Once the participant said “pain,” the administrator ceased applying pressure and the level of force was recorded. After a 90s break, the algometer was reapplied and the participant was told to say “stop” when the pain was too severe to continue. This constituted a measure of pain tolerance. Once the participant said “stop,” the administrator ceased applying pressure and the level of force was recorded. This process was repeated five times with 90s intervals between applications for both threshold and tolerance and the average score across the five trials was used as an index of total threshold and tolerance. Participants were highly consistent in their endorsement of both threshold and tolerance, with alpha coefficients of .97 for both variables.

2.4. Behavioral task

To assess participants' willingness to persist through pain and distress, we developed an enhanced version of the Distress Tolerance Test (DTT; [Nock and Mendes, 2008](#)). The DTT is a behaviorally-based distress tolerance task adapted from the Wisconsin Card Sort Test (WCST; [Grant and Berg, 1948](#)). In this task, participants are presented with a deck of 64 cards, placed face down in a pile and featuring images that differ by shape, color, and number. Participants are told to sort each card by placing them beneath one of four sample cards laid across the table in front of them. No instructions are provided as to how the participant should sort the cards. Unlike the original WCST, in the DTT there are no actual correct methods for sorting. Instead, the first three sorts are said to be correct, the next seven are said to be incorrect, the eleventh is said to be correct, and all subsequent sorts are said to be incorrect. The only feedback provided by the administrator is the word “correct” or “incorrect.” In the original DTT, participants are given the option to quit the task after 20 sorts and distress tolerance is measured by counting the number of cards sorted prior to discontinuing the task. Prior research has demonstrated that the DTT induces negative affect and that, whereas sorting fewer cards is associated with physiological arousal and lifetime engagement in non-suicidal self-injury ([Nock and Mendes, 2008](#)), sorting more cards is associated with greater self-reported capability for suicide ([Anestis and Joiner, 2012](#)).

In our enhanced version of the DTT, 90% of the participant's baseline pain tolerance was applied continuously by a second member of the research team, beginning immediately after

instructions were read. Because we were administering pain, we told participants they could quit the task at any time. In an effort to mirror the decisional balance in a suicide attempt, we told participants that if they persisted through the entire task, they would then be able to opt out of all but five minutes of the remaining protocol and that, although they could quit at any time, this would result in administration of the full remaining 20 min. Our goal in this design was not to mirror suicidal behavior, but rather to mirror a specific type of decision required in suicidal behavior that previous research suggests enhances the association between thinking about suicide and acting on such thoughts (Anestis et al., 2014a, 2014b). A total of 51% of the sample persisted through the entire task.

3. Procedure

Participants interested in participating contacted the research team by email using information provided in the recruitment materials. Participants were then directed to a website on which they could schedule their appointment. On the day of their appointment, the participant reported to a laboratory setting. After the protocol was explained and prior to its onset, participants provided informed consent. The protocol began with the administration of a structured interview assessing the participant's lifetime history of non-suicidal self-injury and suicidal behavior. The participant then took part in a baseline pain tolerance task. Upon completion of this portion of the protocol, the participant then completed a series of self-report questionnaires through a secure server in a private room on a laptop computer provided by the research team. Upon completing the self-report questionnaires, the participant took part in the enhanced DTT. Each participant was awarded a \$20 gift card for their participation. Approval was received from the university's Institutional Review Board prior to the onset of data collection.

4. Results

Descriptive statistics and correlations for the variables of interest can be found in Table 1.

5. Preliminary analyses

Preliminary analyses indicated that 35 (35.0%) participants reported a prior history of at least one suicide attempt. Additionally, 31 (31.0%) participants endorsed current suicidal ideation.

Table 1
Descriptive statistics and correlations among variables of interest.

	1	2	3	4
1 Pain tolerance	–	.05	.03	.06
2 Task persistence	–.03	–	.40*	.14
3 Suicidal thoughts	.14	.07	–	.33
4 Suicide attempts	.06	.03	–.50**	–
Mean	17.92	43.23	1.09	2.40
Standard deviation	6.15	22.96	1.92	6.92
Minimum	3.62	5.00	.00	.00
Maximum	30.36	64.00	9.00	23.16

Values above the diagonal refer to participants with a history of 1+ lifetime suicide attempts; Values below the diagonal refer to the full sample; Three univariate outliers were noted in participant suicide attempt histories. The outliers were adjusted to three standard deviations above the mean (23.16).

* Significant at the $p < .05$ level.
** Significant at the $p < .01$ level.

Table 2
Task persistence levels across varying degrees of suicidality.

	Pain threshold			Pain tolerance			Cards sorted		
	Mean (SE)	F	p	Mean (SE)	F	p	Mean (SE)	F	p
Current suicidal ideation		.03	.870		.36	.550		4.92	.029
Yes (n=29)	11.19 (1.07)			18.62 (1.17)			49.03 (4.21)		
No (n=69)	11.41 (.77)			17.75 (.85)			37.42 (3.10)		
Lifetime suicide attempt		.48	.490		.03	.857		1.47	.229
Yes (n=34)	10.84 (.96)			18.32 (1.05)			46.40 (3.56)		
No (n=64)	11.76 (.91)			18.05 (1.00)			40.04 (3.84)		

6. Primary analysis

Preliminary examinations of task performance indicated that, after controlling for pain threshold and tolerance, individuals with current suicidal ideation persisted longer on the task than did individuals without current suicidal ideation (mean number of cards sorted=49.03 vs 37.42; $F=4.92$; $p=.029$); however, those with a lifetime history of suicidal behavior did not differ on task performance relative to those without a lifetime history of suicidal behavior (40.04 vs 46.40; $F=1.47$; $p=.229$). Individuals did not differ on pain tolerance or threshold based upon current suicidal ideation status or lifetime suicidal behavior status. These results are presented in Table 2.

Results indicated that task persistence moderated the relationship between current suicidal thoughts and lifetime suicide attempts ($b=.01$; $SE=.00$; $p=.03$; $f^2=.05$). Follow-up analyses of simple slopes indicated that the relationship between current suicidal thoughts and lifetime suicide attempts was significant at mean ($t=5.16$; $p<.001$) and high ($t=5.40$; $p<.001$) but not low ($t=1.96$; $p=.053$) levels of task persistence. These results are presented in Table 3^{1,2}

7. Discussion

In the current study, persistence on a painful and distressing task significantly moderated the relationship between current suicidal thoughts and lifetime suicide attempts. The task tested whether participants were willing and able to endure pain and distress to escape from future unwanted experiences (versus immediate escape from acute aversive affective and physiological sensations). This paradigm was designed to approximate an important aspect of the decision making process for individuals who engage in suicidal behavior: the decision to continue the pursuit of

¹ Because lifetime suicide attempts can be conceptualized as a count variable, we also re-ran our analyses using a negative binomial regression. Results were consistent with those from the hierarchical linear regression. The omnibus test was significant ($\chi^2=45.10$; $p<.001$) and task persistence moderated the relationship between suicidal ideation and lifetime suicide attempts (Wald $\chi^2=7.34$; $p=.007$).

² In order to guard against spurious results due to the inclusion of covariates, we re-ran our analyses including only the main effects of the interaction terms as well as pain threshold and tolerance (which are used to compute task parameters and are thus required to adjust for differences in the nature of the task from participant to participant). Again, results were unchanged in terms of significance and direction.

Table 3

Task persistence moderating the relationship between current suicidal thoughts and lifetime suicide attempts.

	R^2	ΔR^2	t	p
	.291			
Sex			1.60	.113
Age			1.91	.060
Race			-.58	.563
Pain tolerance			.11	.913
Task persistence			-.73	.470
Suicidal thoughts			.49	.629
	.325	.034		
Thoughts*persistence			2.11	.038

Note: Task persistence = number of cards sorted while 90% of baseline pain tolerance applied before quitting the task.

a goal (death) even under conditions of acute sensations of extreme pain and distress.

The current study found that individuals with current suicidal ideation persisted longer on that task than did individuals without thoughts of suicide. Previous literature has suggested that individuals with current depression have greater experimentally induced pain tolerance than matching non-depressed controls (Dickens et al., 2003). The current finding could be explained by greater depression among those with current suicidal ideation and suggests the need for more comparable basic research on laboratory pain perception among those with suicidal ideation. This finding also may suggest that the desire for death may facilitate a willingness to withstand acute distress and physiological pain in pursuit of a long term solution for prolonged distress and/or physiological pain. As noted earlier, however, the vast majority of those who think about suicide do not ultimately make attempts and, as such, main effects models considering ideation do not provide sufficient information to place specific variables (e.g., task persistence) within a proper context in the ideation to action continuum.

In this sense, our proposed moderation model was substantially more important. Indeed, results indicated that the relationship between current suicidal thoughts and lifetime attempts was significant only at mean and high levels of task persistence, with the strength of the relationship increasing at greater levels of persistence. This result could have significant implications for the prediction of those most at risk for death by suicide. A very small percentage of those with suicidal thoughts go on to make a serious suicide attempt (Nock et al., 2008). More accurate identification of those most likely to attempt suicide is a major focus of current research efforts such as the ideation to action framework (Klonsky and May, 2014). Taken together, the findings are consistent with the idea that those with current ideation and an elevated capability for suicide are the most likely to make a serious suicide attempt (Joiner, 2005).

In some ways, our findings are counter intuitive, as several theories of suicide conceptualize suicide itself as a form of escape (e.g., Baumeister, 1990). Such paradigms would argue that task persistence would likely be protective against suicidal behavior in that such persistence might correspond to a willingness to persist in life rather than “give up.” We would argue, however, that such conceptualizations fail to account for the fact that suicidal behavior is remarkably difficult and requires a specific capability in order to override our innate drive for survival. Furthermore, mounting evidence supporting theories that advance the notion of the capability for suicide (e.g., Joiner, 2005) and contradicting the notion that suicide often occurs impulsively (e.g., Anestis et al., 2014a, 2014b) represent profound challenges for escape models.

The task in this study was the first to add pain to the distressing card-sorting task developed by Nock and Mendes (2008).

However, looking at previous studies that used a pain-free version of the card-sorting task is useful for understanding the sample. For example, in a large sample of undergraduates, only 10% completed the entire card sort (Anestis and Joiner, 2012). This suggests that even in isolation, the card sorting task is extremely aversive. In contrast, 51% of our community sample completed the entire card-sorting task, even with the addition of 90% of their baseline pain threshold being administered via algometer. This ability to endure pain and distress in pursuit of a goal (i.e. ending the study early) aligns well with the high level of suicide attempters in the sample.

There is mounting evidence that the relationship between low distress tolerance and elevated suicidal ideation masks a more pernicious relationship between high distress tolerance and greater likelihood of a suicide attempt (Anestis et al., 2012). Low distress tolerance is a risk factor for many forms of psychopathology (Leyro et al., 2010); however, our results suggest that an inability to tolerate distress is associated with increased thoughts of suicide, but ultimately serves as an obstacle to suicidal behavior, which requires individuals to persist amidst pain and distress in the pursuit of a specific goal (death).

It should also be noted that the enhanced DTT appears to serve as a particularly suitable moderator variable in that, although those with ideation persisted longer than those without ideation, the task was not significantly correlated with either the predictor variable (suicidal ideation) or the criterion variable (suicide attempts). As Baron and Kenny (1986) noted, this provides an optimal situation for interpreting significant interaction effects. Furthermore, because the capability for suicide is theorized to be orthogonal to suicidal ideation and unlikely to result in suicidal behavior in the absence of suicidal desire (Joiner, 2005), our capability-relevant behavioral measure would not be expected to demonstrate significant zero-order relationships with either variable. This is further supported in the lack of significant differences on task performance between those with and without prior suicide attempts. We would also note that, among participants with one or more prior suicide attempts, task persistence was significantly and positively correlated with severity of current suicidal ideation, indicating that the presence of a prior attempt facilitates persistence among those thinking about suicide. The relevance of task persistence in our model thus only emerges in the presence of risk, which highlights that suicide risk is not a static variable, consistent with current leading theoretical frameworks (e.g., Joiner, 2005; Klonsky and May 2015; Rudd, 2000).

One limitation of the current study is that we could not assess the temporal relationship between suicide variables given the cross-sectional design of the study. In this sense, we could not examine the utility of our task in predicting important aspects of ideation to action models. However, previous research highlights that those with either a past suicide attempt or multiple suicide attempts have categorically higher risk of future suicide attempt (Joiner et al., 1999). Suicide attempt has an extremely low base rate in the population, even among those with suicidal thoughts (Joiner, 2005). Therefore, knowing the relationship between suicidal thoughts, task persistence, and suicide attempt history is a useful proxy for predicting who will make a future suicide attempt. In addition, suicide attempt history is the best predictor of death by suicide (Suominen et al., 2004). Nonetheless, the findings should be considered preliminary in that, in the absence of the prospective prediction of suicidal behavior, it is not possible to directly examine the transition from suicidal thoughts to suicide attempt. In their current form, our findings are supportive of our proposed model, but also require replication with a longitudinal design. Similarly, although our protocol did not include a measure of lifetime suicidal ideation, future research should consider examining whether task persistence moderates the association between lifetime ideation and recent suicide attempts. Such an

analysis would build upon our results by providing more direct support for the notion that task persistence represents an important variable involved in the transition from already established suicidal thoughts to emerging suicidal behavior.

Taken together, this study had several notable features. Primarily, it was the first experimental proxy of the decision to persist with distress/pain in pursuit of escape from unwanted future experiences (versus escape from unwanted acute experiences). We believe the enhanced DTT is an ethical and safe experimental approximation of an important component of the process suicidal individuals go through in making a serious or fatal suicide attempt. Second, the sample in this study was drawn from the community and had substantial suicide attempt history. Given the importance of predicting the transition from ideation to action, more work needs to be done with the relatively rare individuals who have attempted suicide. Finally, suicide attempt history was assessed by trained personnel via empirically supported semi-structured suicide history interview. This is important for accurate assessment of suicide history given the findings that self-report of suicide attempt is often inflated by such things as reports of NSSI (Linehan et al., 2006).

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