

Examining the Three-Step Theory (3ST) of Suicide in a Prospective Study of Adult Psychiatric Inpatients

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This study examined the validity and predictive utility of the three-step theory (3ST) of suicide in psychiatric patients. Participants were 190 consecutively admitted adult psychiatric inpatients (53% female, 60% White, ages 18–73) assessed at three time points: baseline, 4 weeks later ($n = 112$), and 3 months postdischarge ($n = 102$). Results were broadly supportive of the 3ST. First, at baseline, an interactive model of pain and hopelessness accounted for substantial variability in suicidal desire, even when controlling for depression and lifetime ideation. This result replicated in different genders and age ranges (i.e., 18–32 and 33–73). Further, pain and hopelessness were robust predictors of suicidal desire weeks and months into the future. Second, among those with pain and hopelessness, lower connectedness, as well as the extent to which pain exceeds connectedness, were robust predictors of higher suicidal desire. Last, a baseline measure of practical capability for suicide predicted suicide attempts both retrospectively and prospectively, even when controlling

for lifetime ideation—however, dispositional and acquired contributors to capability were less predictive. Results support the validity and predictive utility of the 3ST, and suggest that the theory may have utility for guiding risk assessment and intervention.

Keywords: suicide; theory; three-step theory of suicide; 3ST

SUICIDE IS A GLOBAL health concern. Worldwide, every 40 seconds a person dies by suicide, leaving millions of people bereaved (World Health Organization [WHO], 2017). Psychiatric patients constitute a particularly high-risk group for suicide ideation, attempts, and death (King et al., 2010; Troister et al., 2008). Evidence suggests that risk for suicide is especially high following hospitalization (Appleby et al., 1999; Holley et al., 1998), and that the majority of patients who die by suicide have received psychiatric inpatient care within 1 year of their death (Yim et al., 2004). A clearer understanding of what causes some patients, but not others, to feel suicidal and to act on their suicidal thoughts is essential for the development of more effective suicide prevention and intervention.

Difficulties in accurately evaluating suicide risk represent key barriers to improved suicide prevention. Over 78% of psychiatrically hospitalized adults who die by suicide have explicitly denied suicide ideation or intent when last communicating with their care providers (Busch et al., 2003). Clinical tools designed to estimate suicide risk

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appear inadequate. Recent meta-analyses (Carter et al., 2017; Chan et al., 2016) on a range of risk scales find poor positive predictive values for suicidal behavior, suggesting that none of these instruments are sufficiently accurate in predicting suicide in high-risk populations. Results point to a high degree of uncertainty using risk classification (Large et al., 2018) or suicide ideation (McHugh et al., 2019) as an indicator of future attempts in psychiatric inpatients. Suicides, nevertheless, are preventable (WHO, 2017); and the challenge of improving suicide prediction and prevention has yielded new and promising theoretical models.

While traditional theories of suicide have been considerably useful in guiding suicide research and intervention, they have been limited in an important way: they tend to treat suicidality as a single phenomenon in need of a single explanation (Klonsky & May, 2014)—for example, theories implicating hopelessness (Abramson et al., 2000), psychological pain (Shneidman, 1993), social isolation (Durkheim, 1897/1951), and an escape from an aversive state of mind (Baumeister, 1990) as causes of suicide each treat suicidality as a single phenomenon in need of a single explanation. However, it has become increasingly clear that most persons with suicide ideation do not attempt suicide (Klonsky & May, 2014; Nock et al., 2008), and that (a) the development of suicidal thoughts versus (b) the progression from suicidal thoughts to attempts are distinct processes requiring distinct explanations. This distinction is especially important because oft-cited risk factors for suicide, including most mental disorders, depression, hopelessness, and even impulsivity, are robust predictors of suicide ideation but do not meaningfully distinguish those who attempt suicide from those who have suicide ideation without attempts (Klonsky & May, 2014; May & Klonsky, 2016).

A theoretical advance occurred when Thomas Joiner introduced the interpersonal psychological theory of suicide (IPTs; Joiner, 2005; Van Orden et al., 2010). The theory posits that desire for suicide alone is insufficient for an individual to take suicidal action. The IPTs holds that feelings of low belongingness and high burdensomeness combine to bring about suicidal desire, whereas high capability for suicide precipitates the enactment of potentially lethal suicide attempts. From the perspective of the IPTs, attempting suicide requires the capability to overcome the fears of death and pain that are an intrinsic part of making a suicide attempt. The IPTs suggests that this capability can be acquired over time through repeated exposure to painful and provocative events, such as nonsuicidal

self-injury and physical abuse, thereby habituating a person to pain, injury, and death.

The IPTs appears to have spawned a new generation of suicide theories that, likewise, offer separate explanations for (a) the development of suicide ideation and (b) the progression from ideation to suicide attempts. These theories—often referred to as “ideation to action” theories of suicide (Klonsky et al., 2018)—include the integrated motivational volitional (IMV) model (O’Connor, 2011), and most recently, the 3ST (Klonsky & May, 2015).

The 3ST is a parsimonious model of suicide that seeks to explain suicidal desire and attempts in terms of just four factors: pain, hopelessness, connectedness, and suicide capability (see Klonsky & May, 2015, for elaboration). In brief, Step 1 suggests that suicidal desire occurs due to the *combination* of pain (usually psychological) and hopelessness. Thus, pain or hopelessness alone is insufficient to bring about suicidal desire. Step 2 suggests that suicidal desire escalates when pain (which pushes people away from life) exceeds connectedness (which pulls people toward life). Conversely, Step 2 suggests that, among those with pain and hopelessness, connectedness safeguards against increased suicidal desire to the extent that it exceeds one’s pain. Step 3 suggests that acquired, dispositional, and practical contributors to suicide capability facilitate the transition from strong suicidal desire to potentially lethal suicide attempts.

Although the 3ST is relatively new, a growing body of research supports its key premises. A cross-sectional study (Klonsky & May, 2015) utilizing a large U.S.-based online adult sample found that (a) an interactive model of pain and hopelessness accounted for substantial variance in suicidal desire; (b) connectedness, and a variable indexing the connectedness–pain differential, were protective against suicidal desire in those high on both pain and hopelessness; and (c) suicide capability predicted suicide attempt history over and above current and lifetime suicide ideation. Subsequently, these findings were largely replicated in samples of university students in the United Kingdom (Dhingra et al., 2019) and China (Yang et al., 2019).

Other kinds of research also support the 3ST. Research on motivations for suicide attempts in multiple populations supports Step 1 of the 3ST. Specifically, in three samples of suicide attempters—adolescent psychiatric inpatients, adult outpatients, and university students—pain and hopelessness were near-universally endorsed motivations for suicide attempts, and endorsed more often than motivations emphasized by other theories of

suicide, such as those related to burdensomeness, belongingness, or help seeking (May & Klonsky, 2013; May et al., 2016). In addition, both cross-sectional (Resnick et al., 1997) and longitudinal studies in adolescent psychiatric inpatients (Czyz et al., 2019; King et al., 2019) and adolescents (Arango et al., 2019; Gunn et al., 2018) are consistent with Step 2, in that connectedness was found to mitigate against escalating suicidal desire. Finally, recent research on capability for suicide in two U.S.-based community samples highlights the importance of practical capability (in addition to acquired capability as emphasized in previous theories) in facilitating progression from suicidal desire to attempts; specifically, handgun ownership and unsafe firearm storage, two indicators of higher practical capability, strongly increase risk of suicide attempts in the absence of higher rates of mental illness (Anestis et al., 2017; Houtsma et al., 2018).

The present study was designed to address two gaps in the 3ST literature. First, the validity of the 3ST has yet to be tested in psychiatric patients. Previous work has focused on community adults and undergraduate students. Second, no study has examined the utility of the 3ST for the prospective prediction of suicidal desire and attempts. Thus, the purpose of the present study was to examine the validity and predictive utility of 3ST in a sample of psychiatrically hospitalized adults. Measures of the 3ST constructs, as well as suicidal desire and attempts, were administered to consecutively admitted adult psychiatric inpatients at baseline, 4 weeks later, and 3 months postdischarge. Examination of the 3ST in this population during this high-risk period (i.e., the months posthospitalization) could aid the development of valid, theory-informed, evidence-based intervention targets, as well as risk assessment protocols that more efficiently and accurately predict suicidal thoughts and behaviors.

Methods

PARTICIPANTS AND PROCEDURES

Participants were 190 adults (100 females, 90 males), ages 18–73 ($M = 36$, $SD = 0.13$, $Mdn = 33$), who were consecutively admitted to inpatient psychiatry or psychiatric emergency units at an urban hospital in the province of British Columbia of Canada. Participants were English speaking and 78% were born in Canada. The ethnic composition of the sample was 60% White, 22% Asian, 10% First Nations, 4% African, 3% Latin/Mexican, and 3% multiple ethnicities. Eleven percent of the sample endorsed a minority sexual orientation (e.g., gay, bisexual, lesbian, questioning). Most participants reported that their highest education

level was grade 12 or less (45%). Of the remaining participants, 37% reported either taking some college or trades training courses, and 18% reported completing undergraduate education or more. Regarding marital status, 60% of adults were single. 18% were married or common law. 22% were divorced or separated. and 1% were widowed. Fifty-three percent of participants were receiving income or disability assistance, 23% were unemployed, 20% were employed, 3% were receiving a pension, and 1% were self-employed.

This study was approved by the participating health authority's research ethics board. All adult psychiatric inpatients were potentially eligible (i.e., adults both with and without lifetime or current suicide ideation or attempts were included). Exclusion criteria included conditions (e.g., severe mental deficiency, cognitive impairment, active psychosis, or acute substance intoxication) that precluded the ability to complete study measures, though these same patients were eligible once stabilized. Eligibility criteria were determined by patients' psychiatric assessments and feedback from nursing staff in the wards. Participants provided written informed consent before completing a standard demographic form and baseline measures. Data collection took place between June 2016 and September 2017. Baseline data (Time 1/T1) were collected during inpatient hospitalization and the median length of hospitalization was 20 days. The mean number of days between hospital admission and baseline assessment was 9.24 ($SD = 10.42$, $Mdn = 6.5$, range = 0–94). Follow-up data were collected an average of 4 weeks later ($M = 29.18$ days, range = 22–35 days; Time 2/T2), and again an average of 3-months posthospital discharge ($M = 82.71$ days, range = 47–123 days; Time 3/T3) at an outpatient office or in the participants' homes. The same battery of self-report measures was administered at each assessment time point (see the "Measures" section below). Participants received reimbursement for parking and transportation, and \$10, \$20, and \$30 gift cards for completing each assessment, respectively.

MEASURES

Suicide Attempt

The Suicide History Form (SHF; May & Klonsky, 2016) is a brief self-report measure consisting of standardized items from several authoritative sources to briefly assess suicide attempts: items are based on the World Mental Health 2000 Composite International Diagnostic Interview (WMH-CIDI; Kessler & Ustun, 2004), the Self-Injurious Thoughts and Behaviors Interview (SITBI; Nock et al., 2007), and the Suicide Attempt Self-

Injury Interview (SASII; Linehan et al., 2006). The SHF assesses lifetime ideation history, as well as lifetime attempt history and any attempts that occurred between the 4-week and 3-month time points.

Current Suicide Ideation

Current suicide ideation was assessed using the self-report version of the Beck Scale for Suicide Ideation (BSS; Beck & Steer, 1991). The BSS is a widely used 19-item measure of suicide ideation. It covers active and passive ideation, including the presence of plans or preparation. Each item has three response options that are scored from 0 to 2. Because factor-analytic studies find a multidimensional structure to the BSS (Alsalman & Alansari, 2017; Holden & DeLisle, 2005), and we were most interested in assessing suicidal desire (as opposed to plans, preparations, and courage to make an attempt), we used the first five items of the BSS as an index of suicidal desire, since these items have consistently loaded on a suicidal desire factor in these previous studies. In our sample, coefficient alpha for this five-item scale was high and the same ($\alpha = .91$) at each time point.

Psychological Pain

The Scale of Psychache (Holden et al., 2001) measures current mental pain as conceptualized by Shneidman (1993). The original version contains 13 items that are rated on a 5-point Likert scale. Shneidman suggests that suicide ideation develops when psychache becomes *unbearable*. We therefore utilized a brief four-item subset of items consistent with those found in previous work to assess unbearable (as opposed to general) psychological pain (Pachkowski et al., 2019). In our sample, coefficient alpha for the brief four-item scale was $\alpha = .93, .91,$ and $.91$, respectively, at each time point.

Hopelessness

The Beck Hopelessness Scale—Short Form (BHS-SF; Aish et al., 2001; Yip & Cheung, 2006) assesses hopelessness within the past week. Items are rated as true or false and total scores can range from 0 to 4. The BHS-SF is a four-item version of the widely used BHS (Beck et al., 1974), and the short form has demonstrated good psychometric properties (Aish et al., 2001; Yip & Cheung, 2006). In our sample, coefficient alpha for the BHS-SF was $\alpha = .81, .85,$ and $.83$, respectively, at each time point.

Perceived Burdensomeness and Thwarted Belongingness/Connectedness

These constructs, which are part of the IPTS, were measured with the 15-item version of the Interpersonal Needs Questionnaire (INQ-15; Van Orden et al., 2012). The first six statements measure

participants' beliefs about the degree to which they feel they are a burden to others (i.e., burdensomeness) and the last nine statements measure the extent to which they feel connected to others (i.e., belongingness). Participants indicate the degree to which each item is true for them on a 7-point Likert scale. For the purposes of the current study, the thwarted Belongingness scale (reverse scored) was used to index connectedness. In our sample, for the three time points, coefficient alpha for the Belongingness scale was $\alpha = .84, .88,$ and $.90$, respectively; and for the Burdensomeness scale was $\alpha = .93, .93,$ and $.95$, respectively.

Suicide Capability

Two measures were used to assess suicide capability. First, the 20-item Acquired Capability for Suicide Scale (ACSS; Van Orden et al., 2008) measures the extent to which individuals perceive themselves as able to perform dangerous tasks and their degree of comfort with potentially dangerous situations. Items are rated on a 5-point Likert scale and scores can range from 0 to 80. Coefficient alpha for the ACSS was $\alpha = .81, .84,$ and $.85$, respectively, at each time point. Second, a six-item Suicide Capacity Scale (SCS-3; Klonsky & May, 2015) assesses three types of contributors to suicide capability: dispositional (e.g., long-standing pattern of low fear of self-inflicted pain, injury, or death), acquired (e.g., fear of self-inflicted pain, injury, or death had decreased over time), and practical (e.g., access to and knowledge of lethal means). Items are rated on a 7-point Likert scale. Total scores for the SCS-3 can range from 0 to 36. The SCS-3 has shown strong convergence with the more established ACSS in previous work (Klonsky & May, 2015). In our sample, coefficient alpha for the entire SCS-3 scale was $\alpha = .77, .79,$ and $.79$, respectively. The individual subscales comprise just two items each—thus for each subscale we report intercorrelations of these two items rather than alpha for each time point, respectively: practical (.92, .95, and .93), acquired (.70, .67, and .65), and dispositional (.60, .66, and .63).

Depressive Symptoms

The 16-item self-report Quick Inventory of Depressive Symptoms (QIDS-SR16; Rush et al., 2003) assesses depressive symptoms over the last 7 days and is sensitive to changes in depressive severity. Items are rated on a 4-point Likert scale and the total score can range from 0 to 27. Rush et al. reported high internal consistency ($\alpha = .86$) for the QIDS-SR16. In our sample, coefficient alpha for the QIDS-SR16 was good and the same ($\alpha = .83$) across the three time points. The QIDS-SR16 was used as a covariate in the main analysis predicting suicidal

desire because depression severity is one of the strongest predictors of suicidal ideation (May & Klonsky, 2016). Thus, demonstrating incremental prediction of suicidal desire over and above depression provides a useful test of 3ST's explanation for suicidal desire.

Results

SAMPLE CHARACTERISTICS

Retention

The sample comprises 190 participants who completed baseline measures during hospitalization, including 102 who completed measures at all three time points. Retention analyses found no statistically significant differences between those with and without follow-up data regarding demographics (i.e., age, sex) or baseline clinical characteristics (i.e., lifetime suicide ideation, suicidal desire, suicide attempt history, suicide capability, depressive symptoms, pain, hopelessness, or connectedness).

Dropouts

Of the 68 participants who did not complete measures at the 4-week or 3-month time point, 30 were readmitted due to relapse or deterioration of psychiatric conditions, 10 were readmitted with suicide attempts, and 17 with suicidal desire but without attempts after discharge from the hospital. Most incompleters described fear of psychiatric hospitalization or unwanted treatment as primary reasons not to participate in follow-up assessments.

Presence of Suicide Ideation and Attempts

At baseline, 21% ($n = 40$) of participants reported no lifetime suicide ideation or attempts history, 22% ($n = 42$) reported a history of lifetime ideation but no attempts, and 57% ($n = 108$) reported a history of at least one suicide attempt. Among the 40 participants with no history of ideation or attempts, 80% ($n = 32$) had a chart diagnosis indicating psychosis (schizophrenia spectrum disorders or other psychosis), compared to a psychosis rate of 57% ($n = 85$) in the rest of the sample. Among the 108 participants reporting a history of suicide attempts at baseline, 66% ($n = 71$) reported multiple attempts and 34% ($n = 37$) a single attempt.

Regarding the 102 participants who provided complete data at all time points, 15 made at least one suicide attempt between baseline and the 3-month time point—13 of these were reattempts and 2 were first attempts. Adults with a history of suicide attempts at baseline were more likely to attempt suicide during follow-up than adults without a history of attempts (21.3% vs. 4.9%), $\chi^2(1, N = 102) = 5.28, p = .022$.

Chart Diagnoses

All participating adults received comprehensive psychiatric assessment at admission and formal psychiatric evaluation before hospital discharge by licensed psychiatrists. Each participant's admission and discharge chart diagnoses were reviewed and coded separately by two psychiatrists from the research team to determine a primary diagnosis. Of the 190 sampled, independent coding yielded 25 (13%) discrepant cases, which in turn were reviewed case by case by two other team members as tiebreakers. The primary psychiatric diagnoses of the full sample were (a) schizophrenia spectrum disorders or psychosis, 62%; (b) bipolar affective disorders, 21%; (c) major depressive disorders, 23%; and (d) personality disorders, 28%.

DESCRIPTIVE STATISTICS AND ASSOCIATIONS AMONG KEY STUDY VARIABLES

Table 1 displays the means, standard deviations, and Pearson's correlations for predictor variables. As expected, there were robust positive correlations among pain, hopelessness, low belongingness, and burdensomeness across time points. These variables correlated positively but modestly with suicide capability.

Table 2 displays correlations of the above variables with suicidal desire and attempts across different time points. In general, predictor variables were moderately correlated with suicidal desire and attempts across time points, though correlations for suicide capability were smaller. There were no mean differences between genders in suicidal desire, suicide capability, connectedness, or burdensomeness.

EVALUATING VALIDITY AND PREDICTIVE UTILITY OF THE 3ST

Step 1: Pain and Hopelessness Interact to Predict Suicidal Desire

First, we report the direct effects of pain and hopelessness on suicidal desire. As expected, both pain ($r = .71$) and hopelessness ($r = .77$) exhibited robust correlations with suicidal desire at baseline (Time1/T1). Not surprisingly, pain and hopelessness also related strongly to each other ($r = .73$).

Second, as a direct test of Step 1 of the 3ST, hierarchical multiple regressions were conducted to examine whether pain and hopelessness interacted to predict concurrent suicidal desire. For evaluating validity of the 3ST we focus on concurrent prediction because pain and hopelessness can change considerably over just a few days, hours, or even minutes (Bagge et al., 2017; Hallensleben et al., 2019), and thus their causal influence on suicidal desire is expected to manifest concurrently or over similarly short time frames. (In contrast, the

Table 1
Means, Standard Deviations, and Intercorrelations of Predictor Variables Across Three Time Points

Variables	Correlations									
	T1 variables					T2 variables				
	1	2	3	4	5	1	2	3	4	5
1. T1 pain	—	.73**	.63**	.69**	.26**	.60**	.59**	.67**	.54**	.27**
2. T1 hopelessness	.73**	—	.58**	.68**	.26**	.52**	.65**	.60**	.59**	.30**
3. T1 low belongingness	.63**	.58**	—	.69**	.22*	.49**	.46**	.67**	.44**	.17
4. T1 burdensomeness	.69**	.68**	.69**	—	.30**	.61**	.58**	.65**	.74**	.26**
5. T1 SCS-3 ^a	.26**	.26**	.22**	.30**	—	.20*	.26**	.26**	.24*	.77**
<i>M</i>	10.51	1.16	31.27	16.95	20.74	10.52	1.29	31.37	17.40	21.02
<i>SD</i>	5.41	1.44	12.87	11.00	8.96	5.40	1.52	12.63	11.12	9.49
	T2 variables					T3 variables				
	1	2	3	4	5	1	2	3	4	5
1. T2 pain	—	.72**	.73**	.72**	.18	.65**	.56**	.56**	.57**	.02
2. T2 hopelessness	.72**	—	.65**	.79**	.28**	.54**	.55**	.56**	.54**	.12
3. T2 low belongingness	.73**	.65**	—	.66**	.17	.55**	.48**	.67**	.55**	.15
4. T2 burdensomeness	.72**	.79**	.66**	—	.23*	.52**	.51**	.55**	.67**	.13
5. T2 SCS-3 ^a	.18	.28**	.17	.23*	—	.18	.22*	.08	.21*	.70**
<i>M</i>	9.24	0.98	27.06	13.12	19.42	9.12	0.97	27.88	13.62	20.50
<i>SD</i>	4.58	1.42	12.24	9.57	9.72	4.60	1.45	12.35	9.59	9.61
	T3 variables					T1 variables				
	1	2	3	4	5	1	2	3	4	5
1. T3 pain	—	.75**	.80**	.81**	.10	.53**	.50**	.52**	.47**	.27**
2. T3 hopelessness	.75**	—	.72**	.78**	.10	.38**	.40**	.40**	.38**	.23*
3. T3 low belongingness	.80**	.72**	—	.79**	.13	.51**	.41**	.65**	.50**	.17
4. T3 burdensomeness	.81**	.78**	.79**	—	.19	.51**	.52**	.56**	.67**	.26**
5. T3 SCS-3	.10	.10	.13	.19	—	.26**	.28**	.21*	.28**	.54**
<i>M</i>	8.90	1.04	28.40	13.59	21.25	10.60	1.31	31.54	17.93	21.88
<i>SD</i>	4.61	1.45	13.78	10.09	8.90	5.36	1.53	12.20	11.26	9.25

Note. T1 = Time 1, $N = 190$; T2 = Time 2, $n = 112$; T3 = Time 3, $n = 102$; M = mean; SD = standard deviation; SCS-3 = Suicide Capacity Scale. * $p < .05$. ** $p < .01$.

subsequent section examining predictive utility of Step 1 variables focuses on prospective prediction of suicidal desire weeks and months into the future.)

Pain and hopelessness variables assessed at baseline were standardized to aid interpretation of their potential interactive effect on suicidal desire. The interaction term was statistically significant ($t = 4.75$, $p < .001$), and the full model accounted for 68% of the variance in suicidal desire at T1. The interaction term itself explained an additional 4% of variance over and above the main effects, $F(1, 186) = 22.58$, $p < .001$. Further, the interaction term remained significant ($t = 4.98$, $p < .001$) even when the effects of depression and lifetime suicide ideation were controlled for. Given the strong correlation between T1 pain and T1 hopelessness, we confirmed that collinearity diagnostics for each predictor suggested that multicollinearity was not of concern ($.31 < \text{all tolerance values} < .85$).

Next, we explored whether the statistically reliable interaction between pain and hopelessness in predicting suicidal desire would appear consistently across gender and age. The interaction was statistically reliable in both males ($t = 3.10$, $p = .003$; $n = 90$) and females ($t = 4.12$, $p < .001$; $n = 100$), as well as in adults ages 18–32 ($t = 3.52$, $p = .001$; $n = 91$) and 33–73 ($t = 3.48$, $p = .001$; $n = 99$).

To illustrate the potential clinical utility of this interaction for identifying patients with suicidal desire, median splits were utilized to create low and high subgroups for pain and hopelessness. As Figure 1 shows, suicidal desire is substantially higher in the subgroup (a) reporting both high pain and high hopelessness compared to subgroups (b) low on both pain and hopelessness, or (c) high on either pain or hopelessness. Additionally, we examined the number of participants meeting an empirically derived cutoff for severe suicide ideation (i.e., scores of 24 or above on the full BSS;

Table 2
Correlations of Predictor Variables With Suicidal Desire and Suicide Attempts

	Suicidal desire				Suicide attempt			
	Lifetime	T1	T2	T3	Lifetime	T1-T2 ^a	T2-T3 ^a	T1-T3 ^a
T1 pain	.35	.71	.53	.51	.37	.26	.28	.35
T1 hopelessness	.34	.77	.61	.44	.39	.23	.14	.21
T1 low belongingness	.37	.63	.42	.47	.34	.12	.12	.18
T1 burdensomeness	.35	.75	.55	.53	.40	.12	.19	.24
T1 SCS-3	.22	.39	.24	.26	.23	.05	.15	.18
	Suicidal desire				Suicide attempt			
	Lifetime	T1	T2	T3	Lifetime	T1-T2 ^a	T2-T3 ^a	T1-T3 ^a
T2 pain	.40	.49	.67	.50	.43	.35	.27	.40
T2 hopelessness	.30	.62	.84	.59	.33	.31	.20	.32
T2 low belongingness	.32	.57	.60	.50	.33	.31	.28	.36
T2 burdensomeness	.34	.55	.71	.54	.35	.18	.22	.32
T2 SCS-3	.15	.38	.30	.22	.23	.10	.13	.21
	Suicidal desire				Suicide attempt			
	Lifetime	T1	T2	T3	Lifetime	T1-T2 ^a	T2-T3 ^a	T1-T3 ^a
T3 pain	.42	.47	.54	.67	.37	.24	.32	.32
T3 hopelessness	.29	.49	.61	.77	.26	.16	.38	.32
T3 low belongingness	.33	.46	.56	.74	.29	.23	.30	.35
T3 burdensomeness	.35	.51	.57	.78	.32	.21	.30	.32
T3 SCS-3	.05	.32	.18	.24	.18	.06	.19	.18

Note. All correlations above .20 are statistically reliable at $p < .05$. T1 = Time 1, $N = 190$; T2 = Time 2, $n = 112$; T3 = Time 3; T1-T2 = Time 1 to Time 2; T2-T3 = Time 2 to Time 3; T1-T3 = Time 1 to Time 3; SCS-3 = Suicide Capacity Scale.

^a Point-biserial correlations are reported because these variables are dichotomous.

Cochrane-Brink et al., 2000) who fell into each of these subgroups. In our sample, 22 adults met this high threshold for severe suicide ideation, and consistent with the 3ST, all 22 fell into the subgroup high on both pain and hopelessness.

Finally, we examined prediction of the IPTS (Joiner 2005; Van Orden et al., 2010) regarding suicidal desire. The IPTS model stipulates that thwarted belongingness (TB) and perceived burdensomeness (PB) interact to explain suicidal desire. In

the current sample, TB and PB indeed interacted to predict suicidal desire ($t = 3.81, p < .001$) at T1. The full model, including the interaction term, accounted for 62% of the variance in suicidal desire (compared to 68% reported earlier for Step 1 of the 3ST).

Predictive Utility of Pain and Hopelessness.

Next, we examined whether pain and hopelessness could prospectively predict suicidal desire assessed 4 weeks and 3 months in the future. Importantly, these analyses address predictive utility of the 3ST, rather than its validity, because according to the 3ST the causal influence of pain and hopelessness on suicidal desire occurs contemporaneously or under short time intervals (e.g., minutes, hours, days), rather than weeks or months later.

Results indicate that both pain and hopelessness were robust predictors of future suicidal desire. Specifically, T1 pain predicted suicidal desire at the 4 week ($r = .53$) and 3 month ($r = .51$) time points, as did T1 hopelessness at both time points, respectively ($r_s = .61, .44$; all $p_s < .001$). Further, even when controlling for baseline depression and lifetime ideation, the partial correlations between T1 pain and suicidal desire assessed at 4 weeks ($r_p = .29, p = .002$) and 3 months ($r_p = .38, p < .001$), and

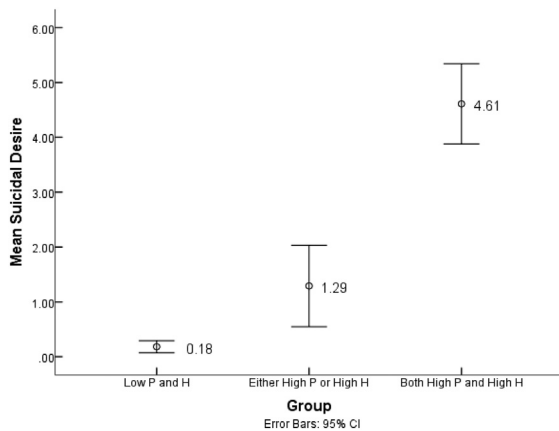


FIGURE 1 Interactive effects of pain (P) and hopelessness (H) on suicidal desire.

between T1 hopelessness and suicidal desire assessed at both time points, respectively ($r_p = .44$, $p < .001$; $r_p = .26$, $p = .009$), remained statistically significant. No statistical interaction between pain and hopelessness was found in the prediction of future suicidal desire at either 4-week or 3-month time points.

Comparison to the IPTS Components. We also examined predictive utility of the IPTS. PB predicted suicidal desire 4-weeks postbaseline ($r = .55$) and 3-months postdischarge ($r = .53$), as did TB at both time points, respectively ($r_s = .42$, $.47$; all $ps < .001$). These correlations are similar in magnitude to those for the 3ST. When controlling for baseline depression and lifetime ideation, the partial correlations between PB and suicidal desire at 4 weeks ($r_p = .35$) and 3 months ($r_p = .40$) remained statistically significant (all $ps < .001$). Similarly, the partial correlation between TB and suicidal desire at 3 months ($r_p = .31$, $p = .002$) was reliable controlling for baseline depression and lifetime ideation, although the correlation between TB and suicidal desire at 4 weeks ($r_p = .17$, $p = .07$) was small and unreliable. No statistical interaction between TB and PB was found when predicting suicidal desire at either time point.

Step 2: Connectedness Protects Against Escalating Suicidal Desire in Individuals With Both Pain and Hopelessness

The 3ST hypothesizes that, among those with high pain and hopelessness, suicidal desire will remain moderate rather than strong when one's connectedness to life is greater than one's pain, or escalate if one's pain exceeds one's connectedness. To evaluate the validity of Step 2 we examine concurrent prediction of suicidal desire given that connectedness can fluctuate meaningfully over short periods of time and thus exert its influence on suicidal desire contemporaneously or over short intervals (Coppersmith et al., 2019). Conversely, the subsequent section on predictive validity of Step 2 variables focuses on prospective prediction of suicidal desire over weeks and months.

To test the validity of Step 2, we utilized baseline data to examine the concurrent relationship of connectedness to suicidal desire in the at-risk subgroup of participants high on both pain and hopelessness. In this subgroup ($n = 77$), the relationship of connectedness to suicidal desire was indeed robust ($r = -.53$, $p < .001$). In those not high on both pain and hopelessness ($n = 113$), the connectedness–suicidal desire correlation was also robust ($r = -.43$, $p < .001$), though the meaning of this correlation is unclear given that suicidal desire in this subgroup is minimal (see Figure 1).

Second, we tested the 3ST's specific premise that, among those high on pain and hopelessness, suicidal desire escalates when one's pain exceeds one's connectedness. To this end, we standardized connectedness and pain scores, and then subtracted standardized connectedness from standardized pain—thus, positive scores denoted greater pain than connectedness, whereas negative scores denoted greater connectedness than pain. If the premise is correct, this difference score should be a particularly important predictor of suicidal desire in the subgroup with pain and hopelessness. As expected, the relationship of the pain–connectedness difference score to suicidal desire was indeed strong ($r = .64$, $p < .001$; $n = 77$) in the subgroup high on both pain and hopelessness. There was also a positive ($r = .41$, $p < .001$; $n = 113$) but lower ($z = -2.15$, $p = .03$) correlation in participants not high on both pain and hopelessness, though the meaning of this correlation is unclear given that suicidal desire in these participants is minimal (as illustrated in Figure 1).

Predictive Utility of Connectedness and the Pain–Connectedness Differential.

Next, we examined the relationship of connectedness to future suicidal desire to explore predictive utility. In the full sample, connectedness prospectively predicted suicidal desire 4-weeks postbaseline ($r = -.42$) and 3-months postdischarge ($r = -.47$; all $ps < .001$). Similarly, the pain–connectedness difference score prospectively predicted suicidal desire at the two follow-up points, respectively ($r_s = .51$, $.52$; all $ps < .001$).

Step 3: Suicide Capability Predicts Transition From Strong Ideation to Attempts

The two measures of suicide capability were used to examine Step 3 of the 3ST: the SCS-3 and ACSS. These measures exhibited positive and large inter-correlations with each other at baseline and both follow-up points, respectively ($r_s = .66$, $.69$, and $.74$; all $ps < .001$). Additionally, all three SCS-3 subscales correlated positively with the ACSS at each time point, respectively: dispositional ($r_s = .64$, $.69$, and $.69$), acquired ($r_s = .58$, $.65$, and $.67$), and practical ($r_s = .34$, $.33$, and $.44$; all $ps < .001$).

Step 3 of the 3ST hypothesizes that dispositional, acquired, and practical contributors to capability for suicide, and that strong suicidal desire progresses to an attempt when total suicide capability is sufficient. To examine this hypothesis, independent samples t tests were conducted to compare total suicide capability, as well as dispositional, acquired, and practical contributors to suicide capability, between suicide attempters and non-attempters.

We first examined retrospective prediction of suicide attempt history. At baseline (T1), total suicide capability differentiated lifetime attempters from lifetime nonattempters ($t = 3.20, p = .002, d = 0.47$). Logistic regressions revealed that this difference did not remain statistically reliable when controlling for lifetime history of ideation ($OR = 1.04, p = .10$) or concurrent suicidal desire ($OR = 1.02, p = .33$). Regarding specific contributors to suicide capability, practical capability exhibited the strongest relationship to suicide attempt history. Specifically, T1 practical capability strongly distinguished lifetime attempters from lifetime nonattempters ($t = -6.05, p < .001, d = 0.88$), and logistic regressions revealed that this difference remained robust even when controlling for lifetime ideation ($OR = 1.12, p = .006$) or concurrent suicidal desire ($OR = 1.11, p = .010$). In contrast, T1 dispositional capability ($t = -.19, p = .85$), T1 acquired capability ($t = -.26, p = .80$), and T1 ACSS ($t = -.99, p = .32$) did not differentiate lifetime attempters and lifetime nonattempters.

Predictive Utility of Suicide Capability. Next, we examined whether T1 suicide capability variables could predict future suicide attempts. As predicted, T1 total suicide capability differentiated those who attempted during the subsequent 3-months post-hospitalization from those who did not attempt suicide within 3 months after hospitalization ($t = -2.58, p = .02, d = 0.59$). However, logistic regressions showed that this difference was not statistically reliable when controlling for lifetime ideation ($OR = 1.06, p = .12$) or baseline suicidal desire ($OR = 1.04, p = .39$). Regarding specific contributors to suicide capability, practical capability was the strongest predictor of future suicide attempts. Specifically, T1 practical capability strongly differentiated those who attempted suicide during follow-up from those who did not ($t = -3.75, p = .001, d = 0.90$), and logistic regressions revealed that T1 practical capability predicted future attempts over and above lifetime ideation ($OR = 1.22, p = .025$), though not over and above baseline suicidal desire ($OR = 1.18, p = .074$). In contrast, T1 dispositional capability ($t = -.46, p = .65$), T1 acquired capability ($t = -.71, p = .48$), and T1 ACSS ($t = .37, p = .71$) each did not predict future attempts.

The majority of participants who attempted suicide during follow-up were reattempters, in that they entered the study with a history of at least one attempt. Thus, to investigate the potential utility of practical capability for indicating risk of reattempt, we examined whether practical capability at baseline (T1) would distinguish reattempters

($n = 13$) from participants who entered the study with lifetime attempts but did not attempt suicide during the follow-up period ($n = 48$). Practical capability was significantly elevated among attempters who would go on to reattempt during follow-up ($d = 0.75, p = .005$).

Discussion

The present study examines the validity and predictive utility of the 3ST in adult psychiatric inpatients. This study addresses important gaps in the literature, in that it is the first to evaluate the 3ST in a clinical sample (previous studies examined community and university populations), and the first to examine the utility of 3ST variables for the prospective prediction of suicidal desire and attempts in the weeks and months following hospitalization.

The first step of the 3ST, that suicidal desire is driven by the *combination* of pain and hopelessness, was supported. Consistent with previous findings (Dhingra et al., 2019; Klonsky & May, 2015), pain and hopelessness interacted to predict concurrent suicidal desire in adult psychiatric patients. Notably, the amount of variability in suicidal desire explained by combination of pain and hopelessness was very large (68%), and this association with suicidal desire was robust over and above depression. Moreover, the interaction was present across male and female genders and different age groups. We also note that the hypothesized pain–hopelessness interaction explained more variance in suicidal desire than the belongingness–burdensomeness interaction postulated by the IPTS (68% to 62%). Other studies have reported similar patterns, specifically 41% to 30% in Klonsky and May, and 56% to 49% in Dhingra et al., though Yang et al. (2019) found similar variance explained by each theory. It is important for future work to continue to evaluate the 3ST in comparison to other theories. Finally, regarding the utility of pain and hopelessness for prospective prediction, both pain and hopelessness were robust predictors of future suicidal desire 4-weeks and 3-months posthospitalization, though their interaction did not add incrementally to this prediction.

The second step of the 3ST, that connectedness mitigates against escalating suicidal desire among those with pain and hopelessness, was also supported. Specifically, among those high on pain and hopelessness, two variables—connectedness, and a variable indexing the extent to which connectedness exceeds pain—were robustly protective against suicidal desire. Consistent with the 3ST, this finding suggests that even in those with pain and hopelessness, suicidal desire remains modest as long as one's

connection exceeds one's pain. Importantly, the magnitude of this predicted association ($r = .64$) is very large, whether evaluated in accordance with traditional statistical guidelines (Cohen, 1992), or in comparison to effect sizes typically reported in psychological individual differences research (Gignac & Szodorai, 2016). Finally, regarding predictive utility, both connectedness and the connectedness–pain differential showed strong predictive utility, robustly correlating with suicidal desire weeks and months in the future.

The third step of the 3ST, that suicide capability facilitates transition to attempts among those with strong suicidal desire, was partially supported. The 3ST proposes that there are dispositional, acquired, and practical contributors to suicide capability, and that strong suicidal desire progresses to a suicide attempt when total suicide capability is sufficiently high. In the present study, consistent with the 3ST, practical capability for suicide predicted both histories of suicide attempts as well as future suicide attempts during the months after admission to, and discharge from, a psychiatric hospital. Moreover, practical capability predicted which participants with suicide attempt histories would reattempt during the months following hospital admission and discharge. However, other measures of suicide capability—including dispositional and acquired—exhibited weaker or negligible relationships to past and future suicide attempts.

Taken together, results are largely consistent with studies of the 3ST in community and undergraduate populations (Dhingra et al., 2019; Klonsky & May, 2015; Yang et al., 2019), and further support the 3ST's parsimonious explanation of suicide. The primary deviation from previous work and theory is that dispositional and acquired capability did not reliably relate to past or future suicide attempts. One explanation is the presence of a ceiling effect, by which most participants began the study with high capability causing limited variability in the construct. This explanation is supported by the fact that most participants had histories of suicide attempts at baseline. Further, 13 of the 15 participants who attempted during the follow-up period had also attempted suicide before the study's baseline, suggesting their capability had already been high. It is possible that the relationship of suicide capability to suicide attempts is more robust in nonclinical populations, such as community (Klonsky & May, 2015) or undergraduate (Dhingra et al., 2019; Yang et al., 2019) samples, in which many individuals have low or moderate suicide capability and the distinction between high- and low-capability participants can be more apparent.

At the same time, it is noteworthy that practical capability exhibited a reliable and robust relationship to both past and future suicide attempts. The main tenet of Step 3 of the 3ST is that strong suicidal desire progresses to an attempt when capability for suicide is sufficiently high. Findings from the present study may suggest that practical contributors are more important for determining suicide capability than acquired or dispositional contributors. Findings from the present study also suggest that a brief measure of practical capability may have considerable utility for predicting future suicide attempts among high-risk psychiatric patients.

Results should be considered in light of several study limitations. First, due to sample characteristics and attrition, this study was not ideally suited to examine the utility of suicide capability for predicting suicide attempts. Over half of the sample had histories of prior suicide attempts because suicide risk is a common cause of psychiatric hospitalization—thus, analyses address prediction of reattempts rather than initial suicide attempts. Moreover, it is possible that some patients who did not provide follow-up data were unavailable because they had attempted suicide and been readmitted to inpatient care (we were able to document that 10 patients who did not complete follow-up assessments had indeed been readmitted for suicide attempts). Finally, because only 15 patients providing follow-up data had attempted suicide during follow-up, statistical power was low for examining the ability of suicide capability to predict future attempts. Future research employing larger and more diverse psychiatric samples, and design features better able to follow up all those who attempt suicide, can help address these limitations.

Second, this study examined the predictive utility of 3ST variables over particular time frames spanning intervals of weeks and months after hospitalization. These time frames are well suited to investigate the utility of 3ST variables for risk assessment and prediction given that suicide attempts are disproportionately common in the months following discharge from inpatient care (Appleby et al., 1999; Holley et al., 1998; Yim et al., 2004). At the same time, shorter intervals would be best suited to evaluate the validity of the 3ST. The 3ST suggests that pain and hopelessness can vary over time and exert causal influence over suicidal desire at relatively short time frames, such as days or even hours or minutes. Thus, future work should use methods, such as ecological momentary assessment (EMA), to examine relationships of 3ST variables to suicidal desire and behavior over

shorter time frames. Indeed, there is a recent influx of EMA studies examining suicidal thoughts and behaviors (Czyz et al., 2019; Hallensleben et al., 2019; Husky et al., 2017; Kleiman et al., 2017)—however, none were specifically designed to evaluate the 3ST.

Third, the present study utilized self-report measures for all key constructs. It is possible that suicidal desire, suicide attempts, pain, hopelessness, connectedness, and/or suicide capability, may be underreported, overreported, or misreported on self-report measures compared to clinical interviews or other assessment methods—for instance, patients who do not want to be hospitalized (Berman, 2018) or saved from suicide (Sheehan et al., 2019) may conceal or deny suicidal thoughts. Thus, future studies should use additional modes of assessment to evaluate the 3ST, particularly when denial of suicidal thoughts is implicated.

Fourth, the present study utilized belongingness as a proxy for connectedness. However, the 3ST defines connectedness broadly to include other kinds of connections including those to valued hobbies, pets, roles, or any sense of purpose or meaning. Thus, future work should utilize additional measures of connectedness to more fully and accurately cover the construct.

Finally, the present study was not ideally suited to take alternative explanations for findings into account—for example, the combination of pain and hopelessness exhibited a strong relationship to suicidal desire, which is consistent with the 3ST. However, it is also possible that this relationship exists because pain and hopelessness are proxies for empirically or conceptually similar variables emphasized by other theories, such as defeat and entrapment in the IMV (O'Connor, 2011). Future work simultaneously assessing constructs from multiple contemporary suicide theories would be better positioned to address possible alternative explanations.

Findings of the present study have key clinical implications for understanding and reducing suicide risk in adult psychiatric inpatients after discharge. Specifically, findings support the 3ST's propositions that suicidal desire and attempts can be understood in terms of four key variables: pain, hopelessness, connectedness, and suicide capability. Thus, the role of patients' diagnoses and life circumstances can be understood to impact suicide risk through their impact on pain, hopelessness, connectedness, and/or capability, and these four variables can guide suicide risk assessments both at admission and throughout the course of treatment. Second, the 3ST suggests that any intervention for reducing suicide risk will succeed to the extent it can

reduce pain, improve hope, enhance connection, and/or decrease capability. On the one hand, these variables will manifest differently and idiosyncratically for different patients. On the other hand, some challenges are common to many patients—for example, one of the greatest challenges facing discharged psychiatric patients is to reestablish their sense of connectedness with others in their life, which can protect against suicidal thoughts (Husky et al., 2017).

In addition, our findings and previous work (Houtsma et al., 2018) suggest that practical capability is important for understanding, predicting, and preventing suicide attempts. Increased knowledge of and access to means (e.g., firearms or prescription medication) can increase risk of suicide among already suicidal patients. Thus, assessment of practical capability is critical for risk assessment, and reducing practical capability is critical for prevention.

In summary, the present study supported the key tenets of the 3ST, especially Steps 1 and 2 of the theory. It is important for future work not only to continue to evaluate the 3ST but to evaluate the 3ST in comparison to alternative theories. Such work is necessary for the field to distinguish more accurate perspectives from less accurate ones, and to continually refine and improve suicide theory (Klonsky, 2020).

Conflict of Interest Statement

The authors declare that there are no conflicts of interest.

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