

Examining Suicidal Desire Through the Lens of the Three-Step Theory: A Cross-Sectional and Longitudinal Investigation in a Community Sample

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Objective: Advancing evidence-based theories of suicide is critical to improving suicide prevention. The aim of the current study was to investigate suicidal desire through an emerging theory of suicide, the Three-Step Theory (3ST). Specifically, this study investigated the validity and predictive utility of Steps 1 and 2 of the 3ST in a Canadian community sample. **Method:** Participants were 487 adults between the ages of 35 to 90 ($M = 59$; 64% female, 87% White) who completed self-report measures assessing suicidal ideation and attempt history, hopelessness, psychological pain, and 5 forms of social connectedness at baseline and 6 months later. **Results:** In support of 3ST predictions, cross-sectional analyses showed (a) the combination of pain and hopelessness strongly correlated with suicidal desire, and (b) connectedness was protective of suicidal desire among those high in pain and hopelessness. Regarding predictive utility, longitudinal analyses showed that pain and hopelessness were strong predictors of future suicidal desire and that connectedness was protective against future suicidal desire. These relationships of pain, hopelessness, and connectedness remained when controlling for baseline suicidal desire. **Conclusions:** Results support the validity and predictive utility of 3ST hypotheses related to suicidal desire. Taken together with previous studies, findings suggest that Steps 1 and 2 are useful for conceptualizing suicide risk and prevention.

What is the public health significance of this article?

This study supports the validity and predictive utility of two steps of the Three-Step Theory of suicide in a community sample of adults. Pain, hopelessness, and connectedness exhibited moderate to strong relationships to current and future suicidal desire in a manner predicted by the theory. Findings suggest that the Three-Step Theory may be a useful perspective for guiding conceptualization and mitigation of suicidal desire.

Keywords: suicide, psychache, hopelessness, connectedness, Three-Step Theory of suicide

Suicide is a major public health problem worldwide. In 2016, suicide accounted for approximately 800,000 deaths, nearly twice the number of homicides that occurred that year (World Health Organization, 2018). In addition to the hundreds of thousands of deaths by suicide that occur each year, many more people contemplate suicide (Borges et al., 2010). Cross-national estimates suggest that approximately 9.2% of people worldwide have seriously thought about or considered suicide at some point in their lives, and that the highest risk period for attempting suicide is within one year after the onset of suicidal thoughts (Nock et al., 2008). Given that suicidal ideation has high global prevalence and

confers high emotional distress, suicidal ideation represents a critical target for research and prevention (Jobs & Joiner, 2019). Research that furthers our understanding of suicidal ideation can inform prevention efforts and enhance interventions for those at-risk.

Several theories, referred to collectively as ideation-to-action theories, offer distinct explanations for the development of suicidal ideation versus the progression from suicidal ideation to attempts (Klonsky & May, 2014). One such theory, the Interpersonal Theory of Suicide (ITS), emphasizes how interpersonal experiences of low belongingness (i.e., a thwarted sense of belonging with others) and perceived burdensomeness (i.e., the perception that one's life is a burden on others) paired with hopelessness about these interpersonal states leads to suicidal desire (Joiner, 2005; Van Orden et al., 2008). A recent meta-analysis of the ITS including 122 distinct samples finds support for the relationship of these variables to suicidal ideation, with the interaction of low belongingness and perceived burdensomeness predicting suicidal desire above and beyond main effects (Chu et al., 2017).

Another model of suicide, the Integrated Motivational Volitional (IMV) model, proposes that experiences of defeat, humiliation, and entrapment in the context of individual vulnera-

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bilities and external stressors predicts the occurrence of suicidal ideation (O'Connor, 2011; O'Connor & Kirtley, 2018). Further, the IMV posits a differential activation hypothesis. That is, with each episode of suicidal ideation, the pathway from distress to thinking about suicide becomes more established and thus more easily activated. Evidence in support of the IMV is accumulating (O'Connor & Portzky, 2018; O'Connor & Kirtley, 2018; Wetherall et al., 2019), suggesting that the model holds promise for improving our understanding of pathways that lead to suicidal ideation (O'Connor & Portzky, 2018; O'Connor & Kirtley, 2018).

A more recent theory of suicide, the Three-Step Theory (3ST), offers an additional and unique perspective on the development and progression of suicidal ideation (Klonsky & May, 2015). According to Step 1 of the 3ST, suicidal thoughts first emerge when one experiences the combination of pain and hopelessness about their pain changing or subsiding in the future. This step of the theory is consistent with past research that has identified pain and hopelessness as the most important motivations for suicide attempts across several samples (May et al., 2016, 2020; May & Klonsky, 2013). In some regards, Step 1 of the 3ST is compatible with the previously described theories of suicide. For example, low belongingness, burdensomeness, defeat, and entrapment are all experiences that may contribute to pain and hopelessness, leading to suicidal desire. However, a key difference is that the 3ST does not focus on any specific pathway to or cause of pain, unlike pathways to suicidal desire proposed by the ITS and IMV. Instead, Step 1 suggests that pain can have numerous sources (e.g., mental illness, relationship disruptions, chronic medical pain, traumatic events, interpersonal loss, and many others) and will lead to suicidal desire when it is experienced as unlikely to improve (Klonsky & May, 2015).

Step 2 of the 3ST describes factors that determine the intensity of suicidal desire once it is present. Most often suicidal desire is experienced as episodic and with low to modest intensity (Kleiman et al., 2018; Nock et al., 2009); however, in some cases, suicidal desire intensifies. Step 2 addresses the conditions under which this happens. Specifically, Step 2 hypothesizes that if a person's pain overwhelms or exceeds their connectedness, their suicidal desire will escalate (Klonsky & May, 2015). Connectedness is defined broadly and can include connections not only to people (e.g., family, friends, romantic partners) but also to a community, job, role, or any sense of meaning or purpose. In short, if someone is connected to things in the world that matter to them, their desire to live can remain strong, and their desire for suicide modest, even in the presence of pain and hopelessness. Key to Step 2 is whether connectedness exceeds pain, in which case the desire for life will remain greater than the desire for suicide, or if pain exceeds or overwhelms connectedness, in which case the desire for suicide escalates.

This role of connectedness is another key feature distinguishing the 3ST from other theories of suicide. For example, low social connectedness is considered to be a primary cause of suicidal desire by the ITS (Joiner, 2005; Van Orden et al., 2010). In contrast, although the 3ST allows for disrupted connectedness to contribute to pain or hopelessness, pain and hopelessness can also have other causes. The essential role of connectedness in the 3ST is as a protective factor against escalating suicidal desire among those experiencing pain and hopelessness.

These first two steps of the 3ST have been supported in multiple studies: a large online sample in the United States (Klonsky & May, 2015), a sample of undergraduate students in the United Kingdom (Dhingra et al., 2018), a sample of undergraduate students in China (Yang et al., 2018), and most recently, a sample of adult psychiatric inpatients (Tsai et al., 2020). Though results from these studies are promising, several limitations of studies to date must be addressed. First, these first two steps of the theory should be examined in other populations, including samples from other countries and with different age ranges. Second, studies examining the 3ST have used a narrow measurement of the construct of connectedness, focusing only on belongingness, even though the definition of connectedness in the 3ST is broader. Specifically, in the 3ST, connectedness includes belongingness, but extends beyond that to connections to various people and communities, one's career, pets, valued hobbies, or any sense of meaning or purpose (Klonsky & May, 2015). These different kinds of connectedness also need to be assessed in studies of the 3ST, especially given research suggesting that different measures and forms of social connection relate differently to health outcomes (Holt-Lunstad et al., 2015; Valtorta et al., 2016).

Finally, previous research on the 3ST has largely been cross-sectional rather than longitudinal (but see Tsai et al., 2020). A cross-sectional design is reasonable for examining the validity of the first two steps of the 3ST given that these two steps explain the presence of current suicidal desire (Klonsky & May, 2015). In other words, according to the 3ST, the best predictors of current suicidal desire are one's current experiences of pain, hopelessness, and connectedness. However, in addition to evaluating validity of a theory, it is also useful to understand whether variables emphasized by Steps 1 and 2 of the 3ST offer value in predictive utility. Mental health providers are often tasked with assessing and managing suicide risk (Chu et al., 2015). As such, examining 3ST variables within a longitudinal research design can aid in understanding the relative stability of these variables, their interrelationships over time, and their potential utility as risk factors for future suicidal desire.

Given these limitations of previous work, the current study has three primary aims: (a) to assess the validity of Steps 1 and 2 of the 3ST in a community-based sample of Canadian adults in an older age range than examined in previous studies, (b) to measure connectedness more broadly than in previous studies and thus more in line with the 3ST description of this variable, and (c) to use a longitudinal design to explore whether 3ST variables explaining current suicidal desire also offer utility for predicting suicidal desire several months in the future. Despite the ways in which this sample differs from previously examined samples, the 3ST is hypothesized to generalize across different groups and settings. Therefore, in line with Step 1 of the theory, we hypothesize that at each time point, pain and hopelessness will interact to predict current suicidal desire over and above main effects of pain and hopelessness. In accordance with Step 2, we hypothesize that the extent to which pain exceeds connectedness will predict stronger current suicidal desire among those who are high in pain and hopelessness. Finally, we will explore how pain, hopelessness, and connectedness predict suicidal desire 6 months in the future; because current pain, hopelessness, and connectedness are likely reliable predictors

of future pain, hopelessness, and connectedness, we expect them to have utility for predicting future suicidal desire.

Method

Participants

Participants were recruited from the Metro Vancouver area (British Columbia, Canada) with local newspaper ads for a study on “personality and personal distress.” Recruitment was part of a larger project on perfectionism and suicide and assessed many psychosocial constructs not relevant to the current study, including perfectionism, depression, lifestyle, and health (see [Appendix](#) for more information). Individuals were eligible to participate in the study if they had a minimum Grade 8 education and were 35 years or older. The final sample was comprised of 487 adults between the ages of 35 to 90 ($M_{\text{age}} = 58.57$, $SD = 11.71$; see [Table 1](#) for demographic information). Measures were completed in the labo-

ratory or participants were mailed packages containing the measures to be mailed back. Participants were provided with financial compensation and payment for transportation/parking. Six months after the measures were completed, participants were followed up by phone to arrange a time to come into the laboratory or be mailed a package to complete the measures for Time 2. All measures in the current study that were administered at Time 1 were also administered at Time 2, with the exception of demographic information, which was only collected at Time 1. Of the initial sample of 487 adults at Time 1, 446 participants (91.6% of total sample) also completed measures at Time 2. All participants, regardless of risk, were provided with information about crisis services and community wellness resources. Participants reporting imminent risk of harm to self were provided with more immediate potential avenues to help cope (e.g., accompanied to the local Emergency Room) by the principal investigator (who is a Registered Psychologist) or senior level clinical psychology graduate students who were under the supervision of the principal investigator. To calculate power for our interaction effect, we based our effect size estimate on the smaller and thus more conservative effect size reported in the literature ([Klonsky & May, 2015](#)). The current study’s sample of 446 was powered at .99 to detect small interaction effects ($f^2 = 0.05$) and small correlations ($r = .20$; two-tailed; power analysis conducted using G*Power 3.1). This study was approved by the appropriate research ethics board.

Measures

Demographic Information

A demographics form was administered at Time 1 to collect information about participants’ age, sex, ethnicity, marital status, education level, family income, and any current diagnosed medical conditions (see [Table 1](#)).

Suicidal Desire

The Beck Scale for Suicide Ideation (BSS; [Beck & Steer, 1991](#)) assesses suicidal ideation in the past week. Items are rated on a scale ranging from 0 to 2 with higher scores representing greater suicidal ideation. Factor analytic studies of the BSS ([Beck et al., 1979](#); [Beck et al., 1997](#); [Dhingra et al., 2018](#)) find suicidal ideation to be comprised of more than one factor. Thus, to measure suicidal desire unconfounded by other aspects of suicidal ideation (e.g., preparation, courage to attempt), the first five items of this scale were summed and used in analyses (BSS-5). We chose the first five items to comprise the BSS-5 because they consistently load on a “suicidal desire” factor in the aforementioned factor analytic studies and assess domains that demonstrate strong face validity for suicidal desire, specifically, wish to live, wish to die, reasons for living, reasons for dying, and desire to attempt suicide. In addition, this short form of the BSS has been used in previous research before and demonstrated good to excellent internal reliability ([Pachkowski et al., 2019](#); [Shahnaz et al., 2018](#)). In the current study, Cronbach’s alpha of the BSS-5 at Time 1 was .87 and at Time 2 was .88. Our focus on and use of the term *suicidal*

Table 1
Demographic Information Collected at Time 1 From All Participants (n = 487)

Variable	n	%
Age		
35–54	158	32%
55–64	160	33%
65–90	165	34%
No answer	4	1%
Sex		
Male	175	36%
Female	312	64%
Race/ethnicity		
Asian	40	8%
White	418	87%
East Indian	3	1%
Hispanic	1	0%
Indigenous	6	1%
Other	14	3%
No answer	5	1%
Income		
Less than \$25,000	121	25%
\$25,000–50,000	164	35%
\$50,001–100,000	151	32%
More than \$100,000	40	8%
No answer	11	2%
Marital status		
Common-law	40	8%
Divorced/separated	118	24%
Engaged	1	0%
Married	194	40%
Single	88	18%
Widowed	43	9%
No answer	3	1%
Highest level of education		
No high school	14	3%
Grade 12	134	28%
College or university graduate	251	52%
Graduate school	82	17%
No answer	6	1%
Currently diagnosed with a medical condition		
Yes	319	66%
No	163	34%
No answer	5	1%

desire is also consistent with the approach used in the ITS (Joiner et al., 2009).

History of Suicide Attempts

The first item from the Suicide Behaviors Questionnaire (SBQ; Linehan, 1981) was used to characterize history of suicide attempts in the sample. Participants were considered to have a lifetime history of suicide attempt if they selected the response “I attempted to kill myself, but do not think I really meant to die” or “I attempted to kill myself, and think I really hoped to die.”

Hopelessness

The 20-item Beck Hopelessness Scale (BHS; Beck et al., 1974) was used to assess hopelessness during the past week. Items are rated as true or false and summed to create a total score ranging from 0 to 20, where higher scores indicate greater hopelessness. In the current study the BHS demonstrated excellent internal reliability; Cronbach’s alpha at Time 1 was .92 and at Time 2 was .93.

Psychache Scale

The Psychache scale (Holden et al., 2001) is a widely used 13-item self-report measure designed to assess current psychological pain. Participants respond to items on a 5-point Likert scale with total scores ranging from 13 to 65. In the current study, Cronbach’s alpha for the Psychache scale was .97 at Time 1 and at Time 2.

Connectedness

Several different measures and subscales assessing various aspects of social connection were used to assess connectedness in the current study.

De Jong-Gierveld Rasch-Type Loneliness Scale. The De Jong-Gierveld Rasch-Type Loneliness Scale (DRLS; de Jong-Gierveld & Kamphuls, 1985) is a 28-item scale composed of 5 subscales each assessing different dimensions of current loneliness ranging from mild to severe: having a meaningful relationship, feelings of sociability, missing companionship, deprivation feelings connected with specific problem situations such as abandonment, and severe deprivation. Items are rated on a 5-point Likert scale ranging from 1 (*strongly disagree*) to 5 (*strongly agree*). In the present study, three of the five subscales were used to measure connectedness: having a meaningful relationship (DRLS-Relationship), deprivation connected with specific problem situations (DRLS-Problem), and severe deprivation (DRLS-Deprivation). The remaining two subscales, sociability and companionship, assess feelings of loneliness in relationships with acquaintances and neighbors; they were not used in the current study as item content was deemed less relevant to the construct of connectedness, and the coefficient alpha for the sociability scale was unacceptable.

The DRLS-Relationship subscale consists of six items and assesses feelings of loneliness and belongingness that are milder compared to the feelings of social connection measured by other DRLS subscales. Items include “I have a number of friends that I can rely” and “There are many people that I can count on completely.” The DRLS-Problem subscale consists of seven items and captures a more moderate level of loneliness, experienced as deprivation in specific problem situations. Items include “I have lost all my friends from previous years” and “When you feel good,

you may be welcome, but when you’re depressed it’s quite a different matter.” The DRLS-Deprivation subscale consists of seven items and captures the most severe experience of loneliness, described as lack of an intimate attachment and feelings of emptiness or abandonment. Items include “I experience a sense of emptiness around me” and “There’s no one really that I would like to share my ups and downs with”. DRLS-Deprivation and DRLS-Problem were reverse coded so that higher scores reflect greater connectedness; DRLS-Relationship is positively worded and reverse coding was not required. These three subscales all displayed adequate to excellent internal reliability at each time point: DRLS-Relationship (Cronbach’s alpha at Time 1 = .90, Time 2 = .91), DRLS-Deprivation (Cronbach’s alpha at Time 1 = .86, Time 2 = .85), and DRLS-Problem (Cronbach’s alpha at Time 1 = .77, Time 2 = .79).

Social Connectedness Scale—Revised. The Social Connectedness Scale—Revised (SCS-R; Lee et al., 2001; Lee & Robbins, 1995) is a 20-item scale that measures one’s current sense of belonging to others and the world around oneself. Social connectedness as measured by the SCS-R is proposed to be a relatively stable psychological construct that does not fluctuate with changes in relationships, such as the loss of a friend or social exclusion from a group (Lee et al., 2001; Lee & Robbins, 1998). The SCS-R measures a subjective awareness and psychological sense of belonging and enduring interpersonal closeness with the social world. The measure has demonstrated excellent internal reliability in previous research and a strong relationship with a measure of loneliness (Lee et al., 2001). Each item is rated on a 6-point Likert scale ranging from 1 (*strongly disagree*) to 6 (*strongly agree*). Ten items are worded in a positive direction reflecting experiences of closeness with others and 10 items are worded in a negative direction reflecting a mild to moderate sense of distance and lack of connection with others. The 10 negative items were reverse coded so that higher scores on the SCS-R reflect greater connectedness. In the present sample, the SCS-R demonstrated excellent internal reliability at each time point (Cronbach’s alpha at Time 1 = .95 and Time 2 = .95).

Social Provisions Scale. The Social Provisions Scale (SPS; Cutrona & Russell, 1987) is a 24-item measure of social support that assesses the degree to which one’s relationships with others currently provides them with different dimensions of social support. The different dimensions of social support are represented by six subscales composed of four items each: attachment, social integration, reassurance of worth, reliable alliance, guidance, and opportunity for nurturance. Each item is answered using a 4-point Likert scale ranging from 1 (*strongly disagree*) to 4 (*strongly agree*), with half the items in each subscale worded in a positive direction and half in a negative direction. A recent investigation of the factor structure of the SPS finds evidence for a general support factor composed of all items (Perera, 2016), thus, in the present study the SPS was scored by first reverse coding negative worded items and summing all 24 items so that higher scores reflect greater connectedness. At each time point the SPS demonstrated excellent internal reliability (Cronbach’s alpha at Time 1 = .94 and Time 2 = .94).

Results

Data Preparation

Data were analyzed for missingness. At Time 1 and Time 2, the percent of missing data for items from study measures ranged from 2% to 22%. Scale proration was used to handle missing data in cases where less than 10% of items on any one measure were missing, resulting in item-level missing data rates ranging from 1% to 10% across both time points. Scale proration was not used for scales composed of less than 10 items; for these missing data ranged from 2% to 15% (BSS-5 and DRLS subscales). Pairwise methods were used in analyses to handle remaining missing data ($n_s = 413\text{--}487$). (To ensure reliability of findings, key analyses were also run without scale proration and results were highly similar; additional information about these analyses are available from the corresponding author).

Means, standard deviations, and correlations for all key study variables are reported (see Table 2). Regarding normality of data, all variables exhibited acceptable skewness and kurtosis, except the BSS-5, which demonstrated skewness and kurtosis above acceptable levels of $< |2|$ at each time point. One square root transformation was used at each time point so that the measure met acceptable levels of skewness and kurtosis. Measures of connectedness were all strongly correlated ($r_s = .68\text{--}.83$; see Table 2), and an exploratory factor analysis of these measures suggested a single factor solution (Time 1: first eigenvalue = 4.07, second eigenvalue = 0.34; Time 2: first eigenvalue = 4.07, second eigenvalue = 0.31). Thus, these five measures were combined into a single global measure of connectedness by summing z-scores. (Subsequent analyses examining connectedness use the global measure of connectedness; however, analyses were also conducted using each individual connectedness measures. Results from these analyses are similar to those reported in the article and available from the corresponding author upon request).

Presence of Suicidal Ideation and History of Attempts

At Time 1, 27% of the sample reported nonzero scores on the BSS-5 (mean untransformed score = 0.83, $SD = 1.71$), indicating presence of current suicidal desire. At Time 2, 23% of

participants reported nonzero scores on the BSS-5 (mean untransformed score = 0.68, $SD = 1.58$). In addition, 10% of participants reported that they had made a suicide attempt in their lifetime.

Cross-Sectional Analyses Testing Steps 1 and 2 of the 3ST

Step 1

Psychache and hopelessness (BHS) were strongly associated with current suicidal desire at Time 1 and Time 2 (see Table 2). To directly test Step 1 of the 3ST, that pain and hopelessness in combination predict suicidal desire, pain, hopelessness, and their interaction term were entered into hierarchical regression models predicting current suicidal desire at each time point (see Table 3). Consistent with Step 1, at both time-points there were statistically significant interactions of pain and hopelessness in predicting suicidal desire. At Time 1, the overall regression models accounted for 47% of current suicidal desire, with the pain and hopelessness interaction term adding 3% ($f^2 = .05$) of unique explanatory variance to the model ($p < .001$). Similarly, at Time 2, the overall regression models accounted for 52% of the variance in current suicidal desire, with the pain and hopelessness interaction term adding 4% ($f^2 = .08$) of unique explanatory variance to the model ($p < .001$).

We also conducted a supplementary analysis to examine the potential clinical utility of this interaction for identifying patients with suicidal desire. Median splits were used to create subgroups for pain and hopelessness. For descriptive purposes, we refer to subgroups scoring below the median as “low” and subgroups scoring above the median as “high.” As can be seen in Figure 1, suicidal desire was negligible in subgroups with (a) low pain and hopelessness (Time 1 $n = 183$; Time 2 $n = 173$) or (b) either high pain or high hopelessness (Time 1 $n = 106$; Time 2 $n = 107$) but is substantially higher in the subgroup (c) reporting both high pain and high hopelessness (Time 1 $n = 158$; Time 2 $n = 145$). Finally, we examined the percentage of participants falling in each of these subgroup categories using an empirically derived cut-off for severe suicidal ideation (i.e., scores of 24 or greater on the full 19-item BSS; [Cochrane-Brink](#)

Table 2

Means, Standard Deviations, Intercorrelations, and 6-Month Test–Retest Stability of Key Study Variables

Variable	1	2	3	4a	4b	4c	4d	4e	4f	<i>M (SD)</i> Time 1	<i>M (SD)</i> Time 2
1. BSS-5	.64	.61	.62	-.43	-.44	-.54	-.53	-.52	-.54	0.83 (1.71)	0.68 (1.58)
2. Psychache Scale	.64	.82	.69	-.53	-.61	-.64	-.64	-.58	-.65	25.38 (12.97)	24.38 (12.42)
3. BHS	.63	.69	.78	-.57	-.59	-.69	-.70	-.65	-.71	5.77 (5.50)	5.56 (5.50)
4a. DRLS-Relationship	-.39	-.50	-.54	.82	.71	.77	.77	.78	.90	21.14 (6.40)	21.38 (6.38)
4b. DRLS-Problem	-.48	-.64	-.61	.75	.76	.79	.74	.68	.86	22.88 (6.01)	23.35 (5.98)
4c. DRLS-Deprivation	-.51	-.68	-.67	.79	.81	.78	.81	.83	.93	26.12 (6.86)	26.46 (6.65)
4d. SCS-R	-.53	-.68	-.72	.75	.74	.80	.86	.80	.91	85.02 (20.93)	86.41 (20.69)
4e. SPS	-.51	-.60	-.64	.78	.70	.81	.77	.82	.91	76.89 (14.20)	77.70 (13.65)
4f. Connectedness	-.56	-.70	-.72	.91	.89	.93	.90	.90	.89	—	—

Note. BSS-5 = first five items of Beck Scale for Suicide Ideation with one square root transformation (*Ms* and *SDs* reported are based on untransformed variables); BHS = Beck Hopelessness Scale; Connectedness = global measure of connectedness created from z-score summation of all five connectedness measures; DRLS = De Jong-Gierveld Rasch-Type Loneliness Scale; SCS-R = Social Connectedness Scale—Revised; SPS = Social Provisions Scale. Above the diagonal are correlations from Time 1, below the diagonal are correlations from Time 2. Italicized values are test–retest correlations. All correlations statistically significant at $p < .001$.

Table 3*Pain and Hopelessness Predicting Suicidal Desire Cross-Sectionally at Time 1 and Time 2*

Variable	Time 1				Time 2			
	R^2	R^2 change	b (se)	p	R^2	R^2 change	b (se)	p
Step 1	.45			<.001	.48			<.001
Psychache			.02 (.003)	<.001			.02 (.003)	<.001
Hopelessness			.06 (.007)	<.001			.05 (.007)	<.001
Step 2	.47	.03		<.001	.52	.04		<.001
Psychache \times Hopelessness			.002 (<.001)	<.001			.002 (<.001)	<.001

et al., 2000). This high threshold was met by four participants at Time 1, all of whom fell into the subgroup of high pain and high hopelessness. At Time 2, seven participants met this high threshold, six of whom fell into the subgroup of high pain and high hopelessness.

Step 2

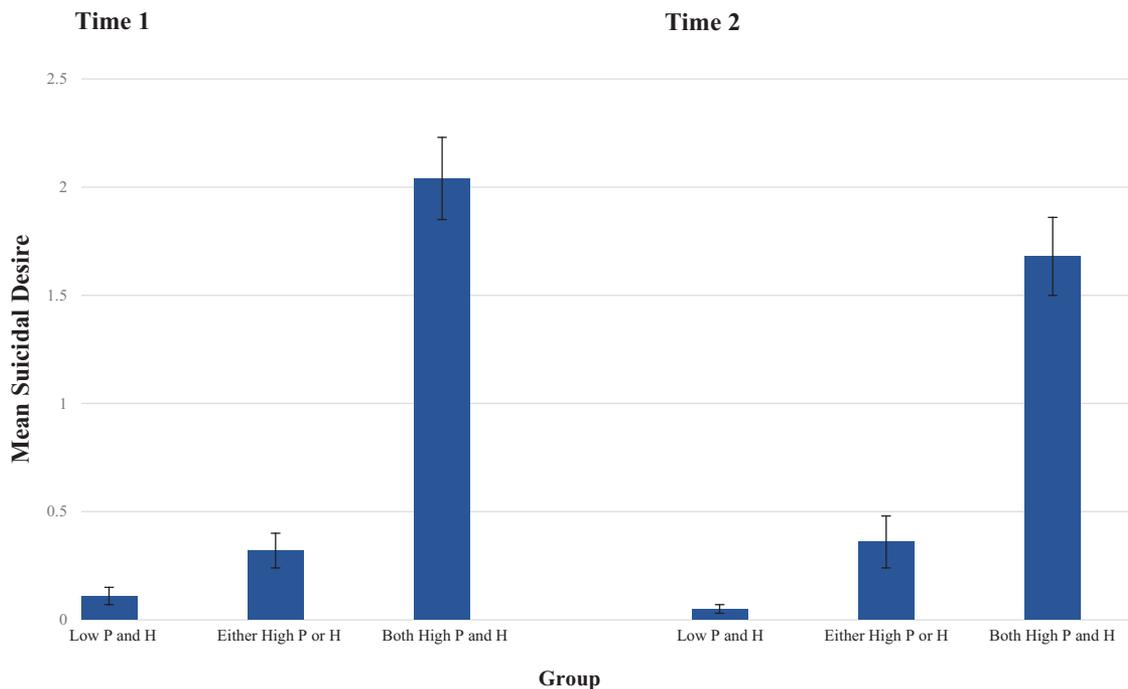
Step 2 states that, among those high in both pain and hopelessness (i.e., those who have met Step 1 criteria), suicidal desire escalates when pain exceeds connectedness. To test this specific hypothesis, we standardized scores for pain and connectedness measures, and then subtracted the connectedness score from the pain score. Thus, positive scores indicate that standardized pain scores exceed standardized connectedness scores, and negative scores reflect that standardized connectedness scores exceed standardized pain scores. Step 2 of the 3ST predicts that the pain-

connectedness difference score should strongly correlate with suicidal desire among those in the subgroup with high pain and high hopelessness.

Results supported this prediction. The pain-connectedness difference score demonstrated a strong correlation with current suicidal desire in the group high in both pain and hopelessness (i.e., those scoring above median cut offs on pain and hopelessness measures) at Time 1, $r = .58, p < .001$, and at Time 2, $r = .62, p < .001$. For the sake of completeness, results in the group not high in both pain and hopelessness (i.e., those scoring below median cut offs on the pain and/or hopelessness measures) are also reported; however, the meaning and importance of these correlations among this group is unclear given that these participants have minimal suicidal desire (see Figure 1), and there is thus little variability in suicidal desire to be explained. In the group not high in both pain and hopelessness,

Figure 1

Mean Suicidal Desire (Untransformed) at Time 1 and 6 Months Later at Time 2 in Three Groups: (a) Low Pain (P) and Hopelessness (H), (b) Either High P or H, and (c) Both High P and H



Note. Error bars represent $1 \pm SE$. See the online article for the color version of this figure.

the pain-connectedness difference score demonstrated a weak correlation with suicidal desire at Time 1, $r = .20$, $p = .002$, and Time 2, $r = .22$, $p = .001$.

Finally, we also looked at the direct effect of connectedness as protective of suicidal desire in the group high in both pain and hopelessness. At Time 1, connectedness was moderately associated with current suicidal desire in the group high in both pain and hopelessness, $r = -.47$, $p < .001$, but weakly associated with suicidal desire in the group not high in both pain and hopelessness, $r = -.17$, $p = .008$. An equivalent pattern was observed at Time 2. Connectedness was moderately associated with current suicidal desire in the group high in both pain and hopelessness, $r = -.44$, $p < .001$, but weakly associated with suicidal desire in the group not high in both pain and hopelessness, $r = -.16$, $p = .011$.

Longitudinal Analyses Examining Stability and Predictive Utility of 3ST Variables

Data were available at both time-points for 446 participants. We examined 6-month test–retest stability for all key study variables, as well as the utility of baseline 3ST variables—pain, hopelessness, and connectedness—to predict suicidal desire 6 months later.

Test–Retest Stability

All measures completed at Time 1 and 2 exhibited strong test–retest stability over the period of 6 months (r range = .64–.89; see Table 2). The highest correlation was observed for the global connectedness measure ($r = .89$), and the lowest for the measure of suicidal desire (BSS-5; $r = .64$).

Pain and Hopelessness Predicting Future Suicidal Desire

First, we examined how pain and hopelessness each predict suicidal desire 6 months in the future. Both Time 1 pain and Time 1 hopelessness exhibited strong correlations with suicidal desire at Time 2 (Psychache scale $r = .51$; BHS $r = .56$; $ps < .001$). These associations remained reliable when controlling for Time 1 suicidal desire (Psychache scale $r_{\text{partial}} = .20$; BHS $r_{\text{partial}} = .27$; $ps < .001$).

Next, we examined whether the combination of pain and hopelessness is useful for predicting future suicidal desire. In a regression analysis predicting Time 2 suicidal desire, Time 1 suicidal desire was entered in Step 1 as a covariate, pain and hopelessness were entered together in Step 2, and their interaction term was entered into Step 3 (see Table 4). The overall model accounted for

46% of the variance in suicidal desire at Time 2, though the interaction of pain and hopelessness did not significantly predict suicidal desire at Time 2 over and above the main effects ($\Delta R^2 < 1\%$; $p = .96$).

Connectedness and the Pain-Connectedness Differential Predicting Future Suicidal Desire

Connectedness at Time 1 demonstrated a strong negative correlation with suicidal desire at Time 2 ($r = -.50$; $p < .001$). Similarly, the pain-connectedness differential demonstrated a strong correlation with suicidal desire at Time 2, ($r = .54$, $p < .001$). Finally, we recomputed these correlations controlling for suicidal desire at Time 1. Partial correlations indicate that connectedness predicted future suicidal desire when controlling for baseline suicidal desire ($r_{\text{partial}} = -.24$, $p < .001$). Similarly, the pain-connectedness differential predicted future suicidal desire when controlling for baseline suicidal desire ($r_{\text{partial}} = .23$, $p < .001$).

Discussion

The current study examined suicidal desire through the lens of the Three-Step Theory (3ST) in a community sample of adults. In contrast to previous studies, connectedness was measured more comprehensively and thus more in line with how the construct is defined in the 3ST. In addition, this study is among the first to include a longitudinal design to examine the utility of 3ST variables for predicting future suicidal desire. Findings support the validity of Steps 1 and 2 of the 3ST in a large, community-based sample of adults living in western Canada, as well as the utility of 3ST variables for predicting suicidal desire 6 months in the future. We detail these findings below.

In support of Step 1 of the theory, the combination of pain and hopelessness was strongly associated with current suicidal desire at both time points. This interaction accounted for 3–4% of additional variance in suicidal desire over and above main effects of pain and hopelessness, an amount similar to or larger than interactions tested in another model of suicide, the ITS (Chu et al., 2017). In support of Step 2, among those high in both pain and hopelessness, higher suicidal desire was strongly associated with the extent to which participants' pain scores exceeded their connectedness scores. This pattern held at both time points. Overall, results from this study align with previous findings supporting Steps 1 and 2 of the 3ST in undergraduate samples (Dhingra et al., 2018; Yang et al., 2018), an online community sample (Klonsky & May, 2015), and a psychiatric inpatient sample (Tsai et al., 2020).

Findings also support the utility of 3ST variables for predicting future suicidal desire. Specifically, pain, hopelessness, connectedness, and the pain-connectedness differential each predicted suicidal desire 6 months into the future. These prospective associations remained when controlling for suicidal desire at baseline. Thus, 3ST variables cannot only be conceptualized as important for understanding current suicidal desire, but as predictors of suicidal desire in the future.

Our findings also align with previous research on motivations for suicide. Specifically, our study found that pain and hopelessness strongly predict both current and future suicidal desire, and that these associations remained significant when controlling for baseline suicidal desire. Consistent with these findings, prior stud-

Table 4
Pain and Hopelessness Predicting Time 2 Suicidal Desire Longitudinally

Variable	R^2	R^2 change	b (se)	p
Step 1	.41			<.001
Suicidal Desire Time 1			.59 (.04)	<.001
Step 2	.46	.05		<.001
Psychache			.005 (.003)	.11
Hopelessness			.03 (.007)	<.001
Step 3	.46	<.001		.96
Psychache \times Hopelessness			<.001 (<.001)	.96

ies in undergraduate, online community, clinical outpatient, and psychiatric inpatient populations find converging evidence that suicide attempts are almost universally motivated by pain and hopelessness, and that these motivations are reported to be more important and common than other hypothesized motivations such as low belongingness, perceived burdensomeness, and help-seeking (May et al., 2016, 2020; May & Klonsky, 2013). In addition, our findings are broadly consistent with other perspectives emphasizing the importance of connectedness for suicide risk (Fässberg et al., 2012), including prominent theories of suicide such as the ITS (Chu et al., 2017; Joiner, 2005) and Durkheim's sociological theory (1897). The present study suggests that connectedness may protect against suicidal desire among those most at risk.

Clinically there are two main implications of these findings. First, psychological pain, hopelessness, and connectedness represent important targets for the treatment of suicidal desire. In particular, any treatment for suicidal desire, regardless of modality, may be expected to succeed to the extent that it reduces pain and hopelessness and increases connectedness. These findings, along with others (Dhingra et al., 2018; Klonsky & May, 2015; Yang et al., 2018), could motivate treatment outcome studies examining the effects on these targets for suicidal desire, or as possible treatment mediators that affect suicide risk through these targets. Second, longitudinal findings also suggest that pain, hopelessness, and connectedness may be useful in the assessment of near-term risk for suicidal desire, especially when taken together with other findings showing longitudinal relationships between psychological pain, hopelessness, connectedness, and suicide risk (Lambert et al., 2020; Qiu et al., 2017; Tsai et al., 2020).

The current study supports and elaborates the growing evidence base for Steps 1 and 2 of the 3ST in several important ways. First, in this study, the 3ST was tested in participants representing a wider age range and different country than in previous studies. Predictions for both Steps 1 and 2 were supported in this new community-based sample of Canadian adults between the ages of 35–90 years old (mean age = 59), in contrast to previous studies that focused on younger participants (mean age = 31 in Klonsky & May, 2015; mean age = 24 in Dhingra et al., 2018; mean age = 36 in Tsai et al., 2020; mean age = 20 in Yang et al., 2018). Results suggest that the predictions of the first two steps of the 3ST may apply across older age ranges.

Second, previous tests of Step 2 have been limited by the use of a single, relatively narrow measure of interpersonal belongingness to assess connectedness. The current study addressed this limitation by utilizing five different measures of social connection. Step 2 hypotheses regarding the role of connectedness were supported across this broader measurement of connection, supporting the relatively broad definition of connectedness utilized by the 3ST.

Third, this study is among the first to explore the utility of 3ST variables in predicting future suicidal desire. Findings suggest that pain, hopelessness, connectedness, and the pain-connectedness differential are all strong predictors of suicidal desire several months in the future. Of note, the statistical interaction of pain and hopelessness did not significantly predict future suicidal desire over and above the effects of pain and hopelessness. One possible interpretation of this finding is that, across a period of 6 months, the combination of pain and hopelessness is less stable than each of these variables on its own. In other words, although pain and

hopelessness are relatively stable ($r_s = .68-.82$), it is only when both are high that suicidal desire occurs, and this co-occurrence is less stable than each of the variables on their own. Findings are consistent with Tsai et al. (2020) and suggest that the combination of pain and hopelessness is less important for predicting future suicidal desire than for explaining current suicidal desire.

This study also has important limitations that warrant note and can guide future work in this area. First, though longitudinal in design, the current study included just one follow-up assessment 6 months after baseline. It will be useful for future work to examine various time frames, including follow-up periods of days or weeks which might be most relevant for real world clinical contexts. Second, though the present sample includes adults across a wide age span, sample size was insufficient to test the theory in particular subgroups of individuals. For example, it is unclear if 3ST predictions are supported in older adults over the age of 70. Third, studies of the 3ST have largely focused on community samples; thus the extent to which the theory generalizes to more clinically severe populations, including those with versus without prior suicide attempts, is less clear. A recent study suggests that the 3ST is supported in an adult psychiatric sample (Tsai et al., 2020), however, it remains important that future studies continue to examine the validity and utility of the 3ST in psychiatric populations. Fourth, the current study did not assess capability for suicide, which is emphasized in the third and final step of the 3ST. Step 3 states that if an individual with high suicidal desire also possesses the capability to attempt suicide (as determined by dispositional, acquired, and practical contributors to capability), they will transition from thinking about suicide to making a suicide attempt (Klonsky & May, 2015). A necessary direction for future work is to further examine Step 3 of the 3ST.

In addition, the present study did not assess other major theories of suicide, such as the ITS or IMV (Joiner, 2005; O'Connor, 2011). It would be valuable to compare different theoretical models within the same study (Klonsky, 2019). Such direct comparisons of theoretical predictions would help refine and advance suicide theory. Sixth, though several measures of social connection were used in the present study, the 3ST definition of connectedness goes beyond social domains to include connections to one's career, pet, valued hobbies, or any source of purpose or meaning (Klonsky & May, 2015). It will be important for future work to develop and use more comprehensive measures of connectedness consistent with the 3ST definition of the construct. In addition, the present study was limited in its measurement of pain. One key difference in the 3ST compared to other theories of suicide is that pain of any kind can make life aversive and thereby contribute to suicidal desire, including physical and medical sources of pain (Klonsky & May, 2015). However, like previous work on the 3ST, the present study only assessed psychological pain. Future work should include measures of physical pain and examine its incremental contribution to suicide risk as specified in the 3ST.

Finally, although this study is among the first to assess the 3ST longitudinally, it used data drawn from two timepoints spaced several months apart. It is possible, even likely, that the 3ST constructs of pain, hopelessness, and connectedness fluctuate in meaningful ways on shorter time-scales of weeks, days, hours, or even minutes, and that these fluctuations coincide with or drive fluctuations in suicidal desire. Indeed, recent work found that both hopelessness and suicidal ideation fluctuate considerably over

short time-frames (Kleiman et al., 2017). Future work evaluating the 3ST should use methodologies, such as ecological momentary assessment, that can test whether short-term changes in the 3ST constructs of pain, hopelessness, and connectedness can be conceptualized as preceding and potentially causing subsequent changes in suicidal desire.

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Appendix

Data Transparency Statement

The data reported in this article were collected as part of a larger study. Findings from the larger data collection are currently in preparation to be reported in two additional articles, however, these articles have not yet been submitted. MS1 (in preparation) focuses on perfectionism and suicide ideation and attempts, examining the research question: does social disconnection mediate the relationship of perfectionism to suicide outcomes. MS2 (in preparation) focuses on perfectionism and depression, and examines the research question: does life stress over the age span moderate

the relationship of perfectionism to depression. These articles differ in aim and variables used from the current article, which aims to examine psychological pain, hopelessness, connectedness, and suicidal desire, and test a specific theory of suicide, the Three Step Theory.

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