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Are suicide attempters more impulsive than suicide ideators?☆

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ABSTRACT

Objective: For over 100 years impulsiveness has been cited as a key factor in why some people that think about killing themselves go on to attempt suicide. Yet prior studies are limited by not using experimental groups that can test this hypothesis and by treating impulsiveness as a unidimensional construct. To overcome these limitations, we compared suicide ideators and suicide attempters on several dimensions of impulsiveness.

Method: In Study 1 we compared inpatient suicide attempters who made an attempt within the prior two weeks (n = 30), current inpatient suicide ideators (n = 31), and community controls (n = 34) on several dimensions of impulsiveness using self-report and behavioral measures. In Study 2 (n = 346), we compared three similar groups based on lifetime and past year suicidal behaviors on several of the measures in Study 1.

Results: In Study 1, we found only that negative urgency was clearly elevated among attempters compared with ideators. In Study 2, there were no significant differences on any impulsiveness constructs, including negative urgency.

Conclusions: Results from the two studies suggest that attempters may not have significantly elevated trait impulsiveness, compared to ideators; however, attempters may have higher impulsiveness when in a negative state.

1. Introduction

Suicide is a leading cause of death around the world [1], yet our understanding of the psychological processes that influence one's decision to attempt suicide is limited. A great deal of interest has focused on the role of impulsiveness, which was identified as a potential risk factor for suicidal behaviors over 100 years ago [2,3]. Impulsiveness is thought to play an instrumental role in suicide because of the presumption that suicidal behaviors are carried out via rash decisions with little consideration for the severe negative consequences. Thus, people that have higher trait impulsiveness and think about suicide are assumed to be at higher risk of acting on suicidal thoughts [2–4].

Two recent meta-analyses found significant but modest relationships between impulsiveness and suicidal behaviors [5,6] and one found no relationship between impulsiveness and suicide death, as measured in psychological autopsy studies [5]. Articles have suggested that impulsiveness may not be directly related to suicidal behaviors, as previously believed [7] and the precise role of impulsiveness in suicidal behavior remains unclear.

Important shortcomings of prior research may have contributed to the lack of clarity regarding the relationship between impulsiveness and suicidal behaviors. First, most studies use experimental groups that cannot test whether increased impulsiveness places people that think about suicide at higher risk of attempting suicide, as hypothesized [4]. Most studies compared "suicidal" vs. "non-suicidal" groups, or "attempters" vs. "non-attempters," neither of which can isolate factors associated with ideation from those associated with attempts. To do this, studies would need to compare "attempters" to "ideators." However, within one of the aforementioned meta-analyses, only three out of 96 studies contain this grouping [5].

Second, most prior studies have treated impulsiveness as a unitary construct, when research suggests it is several independent processes [8–13]. Although researchers debate about which aspects of impulsiveness are distinct [13,14], there are a few areas of relative consensus:

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self-report and behavioral measures of impulsiveness generally fail to correlate [8,11,12,15]; and distinct forms of impulsiveness measured with behavioral tasks, such as impulsive action (i.e., difficulty inhibiting a motor response), impulsive choice (i.e., a tendency to select smaller, immediate rewards because future, larger rewards are devalued by having to wait for them) and reflection impulsiveness (i.e., gathering insufficient evidence prior to a decision) do not correlate [10], are associated with distinct neural correlates [12] and predict different real-world behaviors [9,16].

There is a less clear division between forms of impulsiveness measured with self-report. Two of the most frequently used measures are the Barratt Impulsiveness Scale-11 [17], and the UPPS-P [18]. The BIS-11 has a factor structure that purports to measure unique forms of impulsiveness but commonly is used to assess a general, unidimensional impulsiveness construct. Furthermore, recent work has failed to replicate this factor structure [19]. The UPPS-P [18] is based on a factor analysis of several measures of impulsiveness and assesses three separate dimensions of impulsiveness: positive and negative urgency (i.e. rash action during positive and negative affective states, respectively); lack of premeditation (i.e. failure to plan ahead or properly prepare); lack of perseveration (i.e. easily distracted when faced with monotonous activities) and sensation seeking, which likely is a construct separate from impulsiveness altogether [20–23]. Prior studies suggest that the UPPS-P lack of planning and lack of perseverance may not be completely distinct [14,22]; however, among suicidal participants, they show unique patterns of relationships with other measures of impulsiveness [8], suggesting that each construct explains some unique variance.

Although several prior studies have examined individual facets of impulsiveness among suicidal populations [24–34], we know of only two studies that have done so while comparing suicide attempters and ideators [26,29]. Identifying the specific dimensions of impulsiveness associated with suicide attempts as opposed to those associated with suicidal ideation or general psychiatric issues is a first step to understanding how impulsiveness might increase the risk of suicidal behavior.

Some prior studies have compared attempters and ideators on some specific forms of impulsiveness, such as one study that found that suicide attempters have higher levels of self-reported lack of premeditation compared with ideators [29]. The current report goes beyond this earlier work by comparing attempters, ideators and non-suicidal community controls on a broad array of behavioral and self-reported dimensions of impulsiveness across two studies. The first study compares these three groups using a range of self-report and behavioral measures of impulsiveness to provide a comprehensive view of the association between impulsiveness and suicidal thoughts and behaviors. Moreover, we counterbalanced the order in which participants completed impulsiveness and clinical questionnaires to test whether attempters report that they are more impulsive than ideators only when they are attuned to their suicidal behaviors (i.e. when clinical scales precede impulsiveness scales). The second study partially replicates and extends the first study by comparing suicide attempters, suicide ideators (separated into active vs. passive ideation, to examine more fine-grained distinctions of ideation) based on lifetime and past year suicidal behaviors and non-suicidal controls on several of the same forms of impulsiveness used in the first study. Having two studies with groups based on recent (Study 1) versus more distant (Study 2) suicidal behaviors allows us to test whether impulsiveness is heightened among attempters close in time to the attempt (i.e. increased trait or state impulsiveness) as well as when the attempt is farther into the past (i.e. increased trait impulsiveness only) [6].

2. Study 1

2.1. Method

2.1.1. Participants

Participants were 95 adults recruited into one of three groups: (i) psychiatric inpatients who had made a suicide attempt in the prior two weeks (attempters; $n = 30$), (ii) psychiatric inpatients with active suicidal ideation within the prior two weeks but without a lifetime history of suicide attempts (ideators; $n = 31$) and (iii) control participants without a lifetime history of active suicidal ideation or attempts (controls; $n = 34$): 32 from the community and two psychiatric inpatients (dropping the two psychiatric inpatient controls did not meaningfully change the results (results available upon request)).

Groups were matched on age (attempters: $M = 26.8$, $SD = 8.9$; ideators: $M = 26.2$, $SD = 8.9$; controls: $M = 27.2$, $SD = 8.3$), sex (60.0–64.7% female) and race (74.2–83.3% European American). See Table S1 in the Supplemental materials for exact numbers and inclusion/exclusion criteria. This study was approved by the Institutional Review Boards at Harvard University and Partner's Healthcare and all participants provided written informed consent before participating.

2.1.2. Procedure

Following informed consent, participants were interviewed with the Pathway to Suicidal Action Interview (see below), completed four behavioral tasks of impulsiveness, then completed self-report measures of (1) clinical constructs (e.g., depression and suicidal behaviors) and (2) impulsiveness/hostility. We counterbalanced the order in which clinical and impulsiveness questionnaires were administered across participants for methodological soundness and because prior papers have discussed how suicide attempters may rate themselves as more impulsive because they attempted suicide (i.e. “prior suicidal experiences are reflected in the impulsivity scores” [1]). The procedure was identical for controls recruited from the community except they were recruited online, participated in a laboratory and were administered the MINI International Neuropsychiatric Interview [35] to obtain history of psychiatric diagnoses.

2.1.3. Materials

2.1.3.1. Clinical measures

2.1.3.1.1. Pre/post risk assessment. A 10-point ratings scale of current mood, desire to die and desire to hurt themselves, administered before and after the study.

2.1.3.1.2. Medical record data. We extracted several variables, including diagnosis and medications, as well as number and duration of hospitalizations from participants' medical records. Due to logistical reasons, we were unable to obtain five participants' records.

2.1.3.1.3. Pathway to Suicidal Action Interview (PSAI). The PSAI assesses several suicidal variables, including a range of suicidal thoughts and actions and was used to classify people as ideators or attempters. Attempting suicide required engaging in a potential harmful action with some intention of dying. Details about and data from these interviews is included in Millner, Lee and Nock [48].

2.1.3.1.4. Other self-report measures. Self-report scales related to clinical matters were the following: the Beck Hopelessness Scale [36], a 20-item self-report instrument that assesses the degree to which one is feeling hopeless about the future (KR-20 = 0.90), the Beck Depression Inventory (BDI-II [37], a 21-item self-report instrument of depressive symptoms ($\alpha = 0.96$), the Beck Suicide Scale for Ideation (SSI; [38], a 21-item self-report instrument that assesses the severity of suicidal thoughts and desires ($\alpha = 0.96$), and the Alcohol-Drug Dependence Brief Survey (adopted from the Army Study to Assess Risk and Resilience in Service members [39]), a brief survey to determine a history of alcohol or drug dependence and recentness of use ($\alpha = 0.85$). In addition to clinical scales, we also assessed socioeconomic status (SES) by summing participants' self-reported income and education,

each on a 7-point scale. Attempters were administered the Beck Suicide Intent Scale (SIS; [40]) a 20-item interview that assesses intent to die from self-injurious behavior.

2.1.3.2. Behavioral measures of impulsiveness. Additional information on each behavioral measure is included in the Supplemental materials.

2.1.3.2.1. Kirby Monetary Delay Questionnaire (MDQ). The MDQ assessed impulsive choice and consisted of 27 choices between smaller immediate monetary rewards and larger delayed rewards among small ($25–$35), medium ($50–$60) and large ($75–$85) amounts [41]. Impulsive choice was demonstrated when participants tended to select more immediate, smaller amounts over delayed, larger amounts. One participant was excluded for inconsistent responses.

2.1.3.2.2. Information Sampling Task (IST). We administered the IST to assess reflection impulsiveness (i.e. gathering insufficient evidence prior to a decision) [42]. Trials started with a 5 × 5 matrix of closed boxes, each containing one of two colors. Opening boxes incurs a small cost but many points are awarded for determining which color is in the majority. Reflection impulsiveness is demonstrated when people tend to make decisions with little information (i.e. choosing a color with few opened boxes).

2.1.3.2.3. Stop-Signal Reaction Time task (SSRT task). The SSRT task [43] assessed impulsive action; specifically, inhibiting an initiated action. Participants pressed two different keys in response to two shapes; however, when the lines of the shape grew larger at some variable interval after onset, participants were supposed to withhold their response. Ten subjects (three attempters, three ideators and four controls) were excluded because they never withheld a response to one shape or they showed accuracy values three standard deviations outside the mean.

2.1.3.2.4. Continuous performance - Go/NoGo task (CPT-GNG). A second form of impulsive action was measured with the CPT-GNG (CPT-GNG; [44]), which required participants to inhibit a prepotent response tendency. Trials consisted of images containing city and mountain scenes across two five-minute blocks. Participants were instructed to press the spacebar in response to the city scenes (“Go” trials) and withhold a response to the mountain scenes (“NoGo” trials). Approximately 90% of trials were Go trials, producing a tendency to respond that required effortful control to inhibit.

2.1.3.3. Self-report measures of impulsiveness

2.1.3.3.1. UPPS-P Impulsive Behavior Scale. The UPPS-P [18] is a 59-item scale assessing 4 different facets of impulsiveness: lack of perseverance (α = 0.50), lack of premeditation (α = 0.87), positive urgency (α = 0.95) and negative urgency (α = 0.87) as well as sensation seeking (α = 0.87). Items range along a 4-point scale from “strongly agree” to “strongly disagree.”

2.1.3.3.2. Barratt Impulsiveness Scale-11 (BIS-11). The BIS-11 [45] is a 30-item measure of impulsiveness. We report the second-order factor subscales, attentional impulsiveness (α = 0.75), motor impulsiveness (α = 0.6) and non-planning (α = 0.78), as well as the BIS-11 total score (α = 0.86).

2.1.4. Analyses

For each dimension of impulsiveness other than the IST, we entered the impulsiveness measure as the dependent measures in separate *Group* (Attempter, Ideator, Control) one-way ANOVAs. For the IST, we conducted a 3 *Group* × 2 *Condition* (Free, Cost) ANOVA. With statistical power set at 0.8 and alpha set at 0.05, these one-way ANOVAs could detect partial eta-squared effect sizes of > 0.095, for the two-way ANOVA, > .16, and 0.72 Cohen's D for differences between ideators and attempters, all of which are considered medium-to-large effect sizes.

To test whether questionnaire counterbalancing affected self-reported impulsiveness constructs, we entered the six self-reported impulsiveness constructs into separate 2 *Group* × 2 *Counterbalance Order* ANOVAs.

After the ANOVAs and follow-up tests, we tested whether “robust statistics” (i.e. R package WRS2) [46], which are analogues of traditional statistics but purportedly more sensitive, would support (or not) the lack of group differences on several constructs. Therefore, for omnibus ANOVA group effects that did not reach statistical significance or where pairwise follow-up tests revealed non-significant differences between ideators and attempters, we re-ran the same analyses using robust versions of these tests, without correcting for multiple comparisons (to maximize sensitivity). With one exception, reported in the Results section, conclusions from robust statistics were consistent with those from ANOVAs and follow-up tests.

For conceptual clarity, we omitted the results of two constructs that fall outside the umbrella of impulsiveness: sensation seeking [20,23,47] and aggression, measured with the Buss-Perry Aggression Questionnaire. We also omitted positive urgency as we did not expect it to play a relevant role in suicidal behaviors. See the Supplemental materials for results of robust statistics analyses, and aggression, sensation seeking and positive urgency results.

2.2. Results

2.2.1. Demographic, clinical and SES characteristics

Groups were well matched on demographic variables (see Table S1). Attempters and ideators had similar clinical severity and were not significantly different across most clinical variables (Table 1) or medications (see Table S3).

2.2.2. Are suicide attempters more impulsive than suicide ideators?

2.2.2.1. Behavioral measures of impulsiveness. We failed to detect differences between attempters, ideators and controls on any behavioral measure of impulsiveness and each had small *Group* effect sizes (Table 2).

2.2.2.2. Self-report measures of impulsiveness. Each one-way *Group* ANOVA revealed significant *Group* effects (Table 2). Overall, lack of premeditation, attentional impulsiveness, negative urgency and the BIS-11 total score were all higher among attempters than ideators. Attempters were higher than community controls on all self-reported impulsiveness dimensions whereas ideators reported greater negative urgency, lack of perseveration and attentional impulsiveness compared with controls (Table 2).

Robust statistics revealed one result different from traditional statistics: motor impulsiveness on the BIS-11was lower among ideators, as compared to attempters and controls; attempters did not differ from controls (see Table S4 and S5).

2.2.3. Effects of questionnaire counterbalancing

For lack of premeditation (UPPS-P), attentional impulsiveness (BIS-11) and BIS-11 total score, attempters reported higher impulsiveness when clinical questionnaires were administered first ($p < .05$) but not when the order was reversed ($p > .5$) (see Table S6). The other UPPS-P or BIS-11 constructs (see Table S6) were unaffected by counterbalancing, as was several clinical and demographic variables and pre-/post-study mood (see Table S7).

2.3. Study 1 discussion

In Study 1 we compared attempters, ideators and controls on several dimensions of impulsiveness. Constructs measured with behavioral tasks failed to show any group differences; however, three impulsiveness dimensions measured with self-report showed higher levels among attempters compared with ideators: negative urgency, attentional impulsiveness and lack of premeditation. For the latter two constructs, there was a counterbalancing effect whereby only participants that completed clinical measures prior to completing impulsiveness

Table 1
Clinical characteristics for Study 1.

	Attempter	Ideator	Control	Test Statistic[b]
	n = 30[a]	n = 31[a]	n = 34	
Medical Chart Diagnosis *(%)N*				
Major Depression	88.5 (23)	90.0 (27)	2.9 (1)	χ^2 = 0.03
Bipolar Disorder	3.8 (1)	3.3 (1)	2.9 (1)	χ^2 = 0.01
Anxiety Disorder	26.9 (7)	40.0 (12)	5.9 (2)	χ^2 = 1.06
Substance Abuse	50.0 (13)	30.0 (9)	0.0 (0)	χ^2 = 2.3
Borderline/Cluster B Symptoms	19.2 (5)	20.0 (6)	2.9 (1)	χ^2 = 0.01
Pre- and Post-Study Status *M(SD)*				
Pre/Study Mood	5.4 (1.6)	5.4 (1.7)	7.6 (2.1)	t = 0.03
Pre/Desire to Die	2.3 (1.9)	2.6 (1.9)	1.0 (0.0)	t = −0.44
Pre/Desire to Hurt Self	2.5 (1.9)	2.3 (1.8)	1.0 (0.2)	t = 0.23
Post/Mood	6.0 (1.7)	5.0 (2.0)	7.9 (1.8)	t = 2.03*
Post/Desire to Die	2.1 (1.5)	2.4 (2.0)	1.0 (0.0)	t = −0.71
Post/Desire to Hurt Self	2.1 (1.5)	2.0 (1.8)	1.0 (0.0)	t = 0.16
Clinical Self Report and Hospitalization *M(SD)*				
Past Month Problematic Drug/ Alcohol Use *N(%)*	14.0 (46.7)	13.0 (41.9)	7.0 (20.6)	χ_2 = 0.14
BDI	34.2 (13.8)	32.8 (12.0)	5.9 (8.7)	t = 0.42
SSI	14.9 (11.9)	11.5 (8.2)	0.2 (0.7)	t = 1.32
BHS	6.4 (6.4)	5.2 (5.2)	2.1 (2.1)	t = −1.45
Psych Hospitalizations	1.7 (1.0)	1.5 (0.9)		t = 0.34
Duration in hospital (Days)	12.1 (11.1)	7.5 (4.5)		t = 2.10*
Number of Participants with Past Suicidal Behaviors *N*(%)				
Aborted Attempts	60.0 (18)	74.2 (23)		$\chi^{2=}$1.39
Interrupted Attempts	23.3 (7)	16.1 (5)		$\chi^{2=}$0.50
Mean Number of Past Suicidal Behaviors *M*(*SD*)				
Age of Onset Ideation	17.4 (9.0)	17.8 (8.7)		
Aborted Attempts	2.0 (3.8)	3.37 (8.9)		
Interrupted Attempts	2.2 (2.4)	1.2 (0.5)		
Attempts[c]	1.9 (1.3)			

BDI = Beck Depression Inventory, SSI = Beck Scale for Suicide Ideation, BHS = Beck Hopelessness Scale.

* Denotes significant differences between attempters and ideators, $p < .05$.

[a] Medical record data were missing for 4 attempters (n = 26) and 1 ideator (n = 30).

[b] Comparisons are between attempters and ideators only. Degrees of Freedom (df) for medical record data χ^2, df = 1, N = 56, for number of past suicidal behaviors χ^2, df = 1, N = 61 and for t-tests, df = 59.

[c] One participant who reported 25–50 suicide attempts was an outlier and removed from the mean number of attempts.

questionnaires showed higher impulsiveness, undermining confidence in these group differences.

Negative urgency was the only impulsiveness construct higher among attempters than ideators and unaffected by counterbalancing. An important limitation to this study is the relatively small sample size, which limits the statistical power to detect small-to-moderate effects. We addressed this limitation in Study 2, which partially replicates and extends several of the primary research questions addressed in Study 1.

3. Study 2

3.1. Method

3.1.1. Participants

Participants in Study 2 were recruited via the internet (e.g., Craigslist) to complete an anonymous online survey. Participants completed a primary survey on suicidal behaviors [48] and a secondary survey with measures of impulsiveness. We did not counterbalance administration order because assessing impulsiveness to replicate Study 1 was a secondary aim. The Harvard University Institutional Review Board approved the study. Respondents provided informed consent.

The Supplemental materials contain the number of participants excluded. We tested four groups: lifetime suicide attempters (n = 97), lifetime active suicidal ideators (without a lifetime attempt (n = 133)), lifetime passive ideators (without lifetime active ideation; n = 47) and non-suicidal controls without a history of suicidal thoughts or behaviors (n = 67). Groups had similar mean ages (*M*s = 31.4–33.8) and each was majority female (61.7–82.7%). The groups also did not differ in terms of percent European American (72.3–84.5%) or SES (M = 4.4–5.0). The age of onset for attempters' active ideation (M = 14.81, SD = 7.21) was younger than that of active ideators' active ideation (M = 17.85, SD = 9.73) and of passive ideators' passive ideation (M = 19.77, SD = 10.22; $p < .05$; see Table S8).

3.1.2. Measures

3.1.2.1. Measure of suicidal behavior. The first survey assessed suicidal behaviors. For ideation, respondents endorsed or denied the lifetime presence of the same six suicidal thoughts in the PSAI. Specifically, we considered the thoughts "I should kill myself" or "Maybe I should kill myself" as active ideation and the thoughts "I wish I was dead" or "Life is not worth living" as passive ideation. Non-suicidal controls denied any active or passive ideation thoughts. Seventeen people had concerning thoughts less severe than passive ideation and were included in the non-suicidal group; however, excluding them did not meaningfully change the results (results available upon request). The survey also assessed the lifetime presence of non-suicidal self-injury, suicide gestures, aborted and interrupted suicide attempts and suicide attempts. For additional survey details, see [48].

3.1.2.2. Impulsiveness measures. The second online survey contained the following measures: MDQ, BIS-11 (attentional impulsiveness (α = 0.81), motor impulsiveness (α = 0.85), non-planning (α = 0.89), and BIS-11 total score (α = 0.94)), UPPS-P (lack of perseverance (α = 0.60), lack of premeditation (α = 0.88), positive urgency (α = 0.95) and negative urgency (α = 0.86), as well as sensation seeking (α = 0.87) and the SES measure. Thus, three of four behavioral measures were not assessed in Study 2.

3.1.3. Coding

Coders classified suicidal behaviors based on narrative descriptions. Coders showed high agreement (*Cohen's k* ≥ 0.85). See Millner, Lee and Nock [48] for details on coding procedures and results.

3.1.4. Analysis

We conducted five separate one-way *Group* (attempters, active ideators, passive ideators, controls) ANOVAs on the eight different constructs of impulsiveness measured (UPPS-P: Negative Urgency, Lack of Premeditation, Lack of Perseverance; BIS-11: Attentional, Nonplanning and Motor Impulsiveness; MDQ: impulsive choice). Like Study 1, we corrected for conducting multiple ANOVAs by controlling the FDR and followed up null effects with robust statistics to increase sensitivity to detect group differences. These analyses could detect small partial eta-effect sizes of > 0.03 and small-to-medium Cohen *D* effect sizes of > 0.38 to detect differences between attempters and ideators (with statistical power at 0.8 and alpha at 0.05).

3.2. Results

Each subscale of the UPPS-P and BIS-11 showed a significant between group effect (Table 3). In each case, suicide attempters or both suicide attempters and ideators reported being significantly more impulsive than non-suicidal controls. Suicide attempters did not report being significantly more impulsive than suicide ideators on any measure. Suicide attempters and active ideators reported higher negative urgency than passive ideators. Comparing groups using (uncorrected) robust statistics revealed no meaningful changes in the results (see

Table 2
Group differences on dimensions of impulsiveness among an inpatient sample (Study 1).

Measure	Construct	Attempters		Ideators		Controls		F Statistic	ES
		M (SD)	95% CI	M (SD)	95% CI	M (SD)	95% CI		
CPT-GNG	Impulsive Action/Sensitivity (d′)	2.61 (0.8)	2.33–2.89	2.78 (0.62)	2.51–3.05	2.92 (0.85)	2.66–3.18	F(2,92) = 1.33	0.03
CPT-GNG	Impulsive Action (Commission Error Rate)	0.25 (0.13)	0.2–0.3	0.25 (0.12)	0.2–0.3	0.26 (0.16)	0.21–0.3	F(2,92) = 0.03	0.0
SSRT	Impulsive Action	279.58 (203.87)	204.06–355.09	312.2 (268.32)	237.92–386.49	241.02 (137.62)	170.08–311.95	F(2,82) = 0.95	0.02
MDQ	Impulsive Choice	−4.2 (1.48)	−4.74–3.67	−4.86 (1.18)	−5.4–4.33	−4.47 (1.69)	−4.98–3.97	F(2,91) = 1.52	0.03
IST	Reflection Impulsiveness (Free Block)	0.92 (0.12)	0.88–0.95	0.93 (0.1)	0.89–0.96	0.96 (0.06)	0.93–0.99	F(2,92) = 1.82	0.04
IST	Reflection Impulsiveness (Cost Block)	0.8 (0.1)	0.76–0.83	0.76 (0.1)	0.73–0.8	0.8 (0.09)	0.76–0.83	F(2,92) = 1.44	0.03
UPPS-P	Lack of Premeditation	24.53 (5.24)[a]	22.33–26.74	20.58 (7.19)[b]	18.41–22.75	20.35 (5.66)[b]	18.28–22.43	F(2,92) = 4.61*,†	0.09
UPPS-P	Negative Urgency	36.07 (7.64)[a]	33.37–38.76	31.84 (7.56)[b]	29.19–34.49	23.94 (7.13)[c]	21.41–26.47	F(2,92) = 22.13*	0.32
UPPS-P	Lack of Perseverance	24.8 (5.02)[a]	22.85–26.75	25 (6.15)[a]	23.08–26.92	17.56 (4.89)[b]	15.73–19.39	F(2,92) = 20.39*	0.31
BIS	Non-planning Impulsiveness	28.3 (5.23)[a]	26.25–30.35	25.81 (6.2)	23.79–27.82	22.53 (5.45)[b]	20.61–24.45	F(2,92) = 8.44*	0.16
BIS	Motor Impulsiveness	24.5 (4.49)[a]	22.98–26.02	22.16 (4.54)	20.67–23.66	21.06 (3.52)[b]	19.63–22.49	F(2,92) = 5.54*	0.11
BIS	Attentional Impulsiveness	20.87 (3.73)[a]	19.43–22.3	18.71 (4.31)[b]	17.3–20.12	15.03 (3.8)[c]	13.68–16.38	F(2,92) = 17.98*,†	0.28
BIS	Total Score	73.93 (9.68)[a]	69.94–77.92	66.97 (12.73)[b]	63.04–70.89	58.88 (10.39)[c]	55.13–62.63	F(2,92) = 15.00*,†	0.25

CPT-GNG = Continuous Performance Task - Go NoGo, SSRT = Stop-Signal Reaction Time task, MDQ = Monetary Delay Questionnaire, IST = Information Sampling Task, BIS = Barratt Impulsiveness Scale-11, ES = Effect size (*Partial* η^2). Means with different letters are significantly different, using Holm-Bonferroni *post-hoc* tests. Means without a letter were not significantly different from any other group.

* Denotes significant *Group* effect.

† Significant differences between attempters and ideators were only present when participants completed clinical questionnaires prior to impulsiveness questionnaires but not when questionnaires were administered in the opposite order.

Tables S9 and S10).

Effect sizes for the comparison between attempters and ideators were somewhat smaller in Study 2 relative to Study 1 (Table 4). We considered two possible explanations for smaller effect sizes in this online sample: (1) participants in the online survey engaged in suicidal behaviors years prior, or (2) they engaged in low-severity attempts. To address these two possibilities, we ran the same ANOVAs as above only among those with past year suicidal behaviors (*ns* = 53 attempters, 71 ideators and 16 passive ideators) and where coders rated the severity of injury for attempters to have caused at least minor injuries or effects (e.g. cut wrists and drew blood; $n = 76$ attempters). The findings, however, remained unchanged (see Tables S9 and S10).

4. General discussion

Longstanding influential models of suicidal behavior [4], as well as more recent models [49], suggest that trait impulsiveness puts those that think about killing themselves at higher risk of attempting suicide. Recent work has started to challenge this dominant framework, suggesting that there are small or no differences in trait impulsiveness between those that think about suicide [29] and those that attempt suicide or that impulsiveness may be indirectly related to suicidal behaviors by potentially exacerbating more proximal risk factors [5,50]. We compared attempters and ideators on several dimensions of impulsiveness across two studies to identify dimensions and found little support for the idea that impulsiveness is increased among attempts, as compared to ideators. In Study 1, among several forms of impulsiveness measured with self-report instruments, attempters had higher scores

Table 3
Group differences on dimensions of impulsiveness among an online sample (Study 2).

Measure	Construct	Attempters		Ideators		Passive Ideators		Controls		F Statistic	ES
		M (SD)	95% CI	M (SD)	95% CI	M (SD)	95% CI	M (SD)	95% CI		
MDQ	Impulsive Choice	−4.89 (1.39)	−5.16–4.62	−5.16 (1.25)	−5.38–4.93	−5.17 (1.17)	−5.56–4.78	−5.11 (1.25)	−5.42–4.79	F(3,313) = 0.87	0.01
UPPS-P	Lack of Premeditation	23.17 (6.01)[a]	22.03–24.32	21.32 (5.46)	20.35–22.29	21.18 (6.04)	19.53–22.82	20.42 (4.93)[b]	19.04–21.8	F(3,327) = 3.57*	0.03
UPPS-P	Negative Urgency	31.49 (7.81)[a]	29.94–33.05	30.17 (7.46)[a]	28.85–31.49	27.18 (7.78)[b]	24.94–29.42	23.5 (7.63)[c]	21.62–25.38	F(3,327) = 16.2*	0.13
UPPS-P	Lack of Perseverance	21.8 (6.55)[a]	20.6–22.99	22.36 (5.8)[a]	21.34–23.37	20.62 (5.71)	18.91–22.34	18.23 (4.89)[b]	16.8–19.67	F(3,327) = 7.63*	0.07
BIS	Non-planning Impulsiveness	24.87 (5.31)[a]	23.8–25.94	24.04 (5.8)[a]	23.12–24.95	23.22 (5.15)[a]	21.65–24.79	20.57 (4.57)[b]	19.28–21.85	F(3,337) = 9.29*	0.08
BIS	Motor Impulsiveness	23.34 (4.49)[a]	22.47–24.21	22.59 (4.5)	21.85–23.33	21.44 (3.94)	20.17–22.72	21.45 (4.03)[b]	20.41–22.49	F(3,337) = 3.4*	0.03
BIS	Attentional Impulsiveness	18.55 (4.48)[a]	17.64–19.46	18.24 (4.9)[a]	17.46–19.02	16.93 (4.46)	15.6–18.27	15.18 (4.01)[b]	14.08–16.28	F(3,337) = 8.87*	0.07
BIS	Total Score	66.26 (11.5)[a]	63.93–68.58	64.42 (12.46)[a]	62.42–66.41	61.24 (11.35)	57.83–64.66	56.96 (10.3)[b]	54.16–59.75	F(3,337) = 9.54*	0.08

MDQ = Monetary Delay Questionnaire, BIS = Barratt Impulsiveness Scale-11, ES = Effect size (*Partial* η^2). Means with different letters are significantly different, using Holm-Bonferroni *post-hoc* tests. Means without a letter were not significantly different from any other group.

* $p < .05$.

Table 4
Effect sizes (Cohen's D) for impulsiveness differences between attempters and active ideators for Study 1 and Study 2.

	Study 1		Study 2	
	Cohen's D	95% CI	Cohen's D	95% CI
CPT Go NoGo (d′)	−0.24	[−0.76–0.29]		
CPT Go NoGo (commission error rate)	0.01	[−0.51–0.52]		
SSRT	0.06	[−0.49–0.63]		
MDQ (log(k))	0.49	[−0.03–1.02]	0.20	[−0.08–0.49]
IST Free Block (pCorr)	−0.08	[−0.57–0.45]		
IST Cost Block (pCorr)	0.38	[−0.16–0.86]		
UPPS-P Lack of premeditation	0.63	[0.08–1.19]	0.25	[−0.02–0.52]
Clinical-Impulsiveness Order	1.48	[0.44–2.28]		
Impulsiveness-Clinical Order	0.06	[−0.67–0.76]		
UPPS-P Negative urgency	0.56	[0.03–1.10]	0.14	[−0.13–0.41]
UPPS-P Lack of perseverance	−0.04	[−0.54–0.48]	−0.11	[−0.38–0.16]
BIS-11 Attentional Impulsiveness	0.53	[−0.001–1.08]	0.10	[−0.16–0.36]
Clinical-Impulsiveness Order	1.23	[0.37–2.09]		
Impulsiveness-Clinical Order	0.09	[−0.61–0.81]		
BIS-11 Motor Impulsiveness	0.52	[−0.03–1.09]	0.18	[−0.08–0.44]
BIS-11 Nonplanning Impulsiveness	0.43	[−0.08–0.95]	0.17	[−0.09–0.42]
BIS-11 Total Score	0.61	[0.06–1.14]	0.18	[−0.08–0.43]
Clinical-Impulsiveness Order	1.33	[0.46–2.22]		
Impulsiveness-Clinical Order	0.19	[−0.54–0.89]		

CPT-GNG = Continuous Performance Task - Go NoGo, SSRT = Stop-Signal Reaction Time task, MDQ = Monetary Delay Questionnaire, IST = Information Sampling Task, BIS = Barratt Impulsiveness Scale-11. "Clinical-Impulsiveness order" indicates effect sizes when participants completed clinical questionnaires prior to impulsiveness questionnaires and "Impulsiveness-Clinical Order" indicates the opposite order. Effect sizes are not provided if administration order did not affect group differences. Confidence intervals were created using a bootstrap procedure from the BootES package in R.

compared with ideators on only three constructs: negative urgency, attentional impulsiveness and lack of premeditation. However, the latter two constructs were partially confounded by counterbalance effects whereby attempters reported significantly higher impulsiveness only when clinical scales were completed prior to impulsiveness scales; there were no group differences when the questionnaire order was reversed. Thus, in Study 1, the only measure significantly higher among attempters compared with ideators and unaffected by counterbalancing effects was negative urgency. In Study 2, among a relatively large online sample, none of the self-reported measures of impulsiveness were statistically higher for attempters compared with ideators, including attentional impulsiveness, lack of premeditation and negative urgency. Several findings warrant additional comment.

The absence of any group differences on impulsiveness constructs measured with behavioral tasks appears to have been caused by relatively typical behavior by suicide attempters and ideators, rather than atypical performance by controls. In prior studies with healthy participants, the same behavioral tasks show similar rates of commission errors on the CPT-GNG and on the SSRT tasks as the groups in the current study (CPT-GNG: 26% commission error rate in [51] versus 24.9–25.7% for the current study; SSRT task: 233 ms–259 ms SSRT in [52]) versus 219–235 ms for the current study).

This is the first study to randomize the order of clinical and impulsiveness questionnaires. We did this for methodological soundness and the concern that attempters might report higher impulsiveness in part due to the fact that they just made a suicide attempt [29]. These data suggest that we cannot rule out that possibility, although they do not necessarily provide strong evidence in support of this idea either, particularly given the small samples used in these analyses (all $ns < 18$). More relevant is that these counterbalancing effects undermine our confidence that attentional impulsiveness and lack of premeditation are truly elevated among attempters.

Compared with ideators, negative urgency was higher among inpatient attempters with more recent attempts (i.e. within the past two weeks) but not among non-inpatient attempters with past-year or lifetime attempts. This latter result is consistent with a previous study in which negative urgency was comparable between lifetime attempters and lifetime ideators [29]. However, the increased negative urgency among recent attempters suggests that this facet of impulsiveness might increase around the time of a suicide attempt and then decreases to a lower level (but still elevated compared to healthy controls) as time passes from the attempt (assuming that trait measures can be influenced by clinical state, as prior studies have suggested [53,54]). Thus, attempters may be characterized by the propensity to reach the higher levels of affect-related impulsiveness – possibly only during particular circumstances or specific highly affective states - that are directly related to attempting suicide. Furthermore, perhaps these higher levels of negative urgency are only detectable around the time of a suicide attempt. An alternative account is that the presence of a recent suicide attempt causes people to artificially elevate their self-reported negative urgency, however, we tried to account for this with the counterbalancing manipulation.

These findings should be interpreted in the context of several important limitations. First, neither sample may be representative of ideators and attempters and, as a result, might not generalize to other suicidal populations. For example, in Study 1, patients receiving electroconvulsive therapy were not considered for participation. Second, failure to reject the null does not necessarily suggest that attempters and ideators have similar levels of impulsiveness. Both studies had low statistical power to detect the observed effects although we used robust statistics without multiple comparisons to minimize false negative results. In Study 2, the need to complete two lengthy surveys may have biased the sample with less impulsive people. Another possibility is that increased impulsiveness is higher only among those that make unplanned or low-lethality attempts [26,55] or that impulsiveness increases risk indirectly through other factors, such as painful and provocative experiences [50]. Third, lack of perseverance had low reliability.

A fourth limitation is that the ideators group contained people that had engaged in aborted and interrupted attempts. Currently, there is no consensus on how these behaviors should be categorized and, generally, these behaviors are not assessed or reported. Thus, perhaps people with these behaviors should not be included as ideators; but in nearly every prior study, many ideators likely have engaged in aborted or interrupted attempts that are omitted from view because they are not measured. Regardless, results did not meaningfully change in Study 2 if ideators that engaged in these behaviors were dropped (results available upon request).

Despite these limitations, these results suggest that trait-level, non-affective impulsiveness may not differ greatly between those that think about suicide and those that have attempted suicide. Researchers should move to understanding how affective states influence impulsive action to escape aversive situations.

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.genhosppsych.2018.08.002.

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