

Short Report

Effect of non-suicidal self-injury on suicidal ideation: real-time monitoring study

Sarah Herzog, Tse-Hwei Choo, Hanga Galfalvy, J. John Mann and Barbara H. Stanley

Summary

Clinical and empirical reports suggest that individuals use non-suicidal self-injury (NSSI) not only to ameliorate dysphoria, but to curb suicidal ideation or avoid suicidal behaviour. To date, however, no study has quantitatively assessed whether NSSI leads to short-term reductions in suicidal ideation. Using real-time monitoring over 7 days in a sample with borderline personality disorder, we found evidence that NSSI is followed by reductions in suicidal ideation in the subsequent hours. This suggests that NSSI may serve as an effective, albeit maladaptive, coping strategy for suicidal states. These findings have important implications for the management of suicide risk and self-harm.

Keywords:

Non-suicidal self-injury; suicidal ideation; ecological momentary assessment; borderline personality disorder; suicidal behaviour.

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Non-suicidal self-injury (NSSI), the self-infliction of bodily harm without apparent suicidal intent, is a potent risk factor for suicidal ideation and suicidal behaviour.¹ Although NSSI and suicidal behaviour are distinct constructs, both forms of self-harm frequently co-occur. NSSI and suicidal behaviour share key instrumental functions, such as escape from aversive internal states, reducing dysphoria or communicating distress.² Some individuals also report engaging in NSSI to ameliorate suicidal thoughts or urges,² a possible by-product of NSSI's regulating effect on mood. In an adolescent sample, nearly half of those who self-harmed reported using NSSI to diminish the urge to attempt suicide.³ However, evidence of NSSI's mitigating impact on suicidal ideation is limited to subjective reports of its perceived effectiveness,⁴ and it remains unclear whether in fact NSSI is associated with subsequent reductions in suicidal ideation. This important to establish, since the success of NSSI's anti-suicidal function may encourage recurrent self-injury.

Despite NSSI's perceived effectiveness in mitigating suicidal states, self-harming suicidal individuals have demonstrably higher long-term risk of suicidal behaviour relative to non-self-harming suicidal individuals.¹ Elevated suicide risk among those who self-harm is consistent with the interpersonal theory of suicide,⁵ which suggests that repeated self-harm may promote a capability for suicide over time by habituating individuals to the fear of physical pain or injury that might otherwise discourage suicidal behaviour. In the short term, however, NSSI may serve to lower acute suicide risk, consistent with findings that individuals with suicidal ideation who self-harm take longer to make the transition to attempted suicide compared with non-self-harming suicidal individuals.⁶ As yet, the functional relationship between NSSI and suicidal states – particularly its short-term effect on suicidal ideation – is not well characterised, partly because of methodological challenges inherent in observing these experiences in research settings. However, recent advances in smartphone-based technology have stimulated new research using ecological momentary assessment (EMA) to study NSSI in real-world contexts.⁷ EMA involves repeated, real-time sampling of participants' thoughts and behaviours over a discrete period, overcoming issues of recall bias, forgetting or *post hoc* reasoning that influence retrospective reporting.

Prior EMA studies have assessed triggers and consequences of NSSI, largely concentrating on NSSI's affective dynamics,⁷ but

none to date have quantitatively evaluated NSSI's real-world effect on suicidal ideation. We sought to address this gap by using real-time monitoring of NSSI and suicidal ideation over 7 days in adults with borderline personality disorder (BPD), a clinical population with exceptionally high rates of NSSI, suicidal ideation and suicidal behaviour.⁸ We hypothesised that episodes of NSSI would lead to a reduction in suicidal ideation in the subsequent hours.

Method**Recruitment**

Eighty-two participants were enrolled in an NSSI intervention trial and completed EMA during the pre-randomisation, pre-treatment stage. All participants provided written consent after receiving a detailed description of study procedures. Protocols were approved by the Institutional Review Board at New York State Psychiatric Institute and complied with up-to-date ethical standards stipulated in the Helsinki Declaration. Eligibility criteria included a DSM-5 BPD diagnosis, current suicidal ideation and history of suicidal behaviour and/or NSSI. A detailed description of the study criteria and clinical assessment measures has been published elsewhere.⁹

EMA procedure

Using smartphones or digital devices, participants completed EMA six times a day within a 12 h wake period for 7 consecutive days. Prompts occurred at random intervals within 2 h epochs. Suicidal ideation and self-harming behaviours were assessed at each epoch, and self-harm was rated for suicidal intent. Participants rated nine suicidal ideation items adapted from the Scale for Suicide Ideation,¹⁰ inquiring how strongly they experienced thoughts or urges to die by suicide on a 0–4 Likert scale. A full description of EMA queries is reported elsewhere.⁹

Statistical analyses

EMA suicidal ideation items were summed into a time-varying suicidal ideation score (range: 0–36). Change in suicidal ideation at a given time t was measured as the difference in suicidal ideation at time t and the epoch immediately preceding it ($t - 1$), for same-day observations. Mixed-effects logistic (NSSI) and linear (suicidal

Table 1 Separate single-predictor linear models of (a) the effect of non-suicidal self-injury (NSSI) on mean suicidal ideation in the following epoch and (b) the effect of NSSI on change in suicidal ideation in the following epoch

Response variable	NSSI in prior epoch		No NSSI in prior epoch		Difference				
	Estimate	s.e.	Estimate	s.e.	Estimate	s.e.	d.f.	<i>t</i>	<i>P</i>
Mean suicidal ideation	17.72	0.79	17.69	0.66	0.03	0.45	2104	0.06	0.954
Suicidal ideation change	-1.77	0.54	0.05	0.1	-1.81	0.56	1559	-3.26	0.001

ideation) models featured participant-level random intercepts and AR(1) within-participant correlation structures.

Results

Sample description

Participants ($n = 82$) were predominantly female (91%) and White (57%), with an average age of 29.4 years (s.d. = 9.5 years). All participants had a history of either NSSI ($n = 76$, median 38 episodes) and/or suicide attempt ($n = 59$, median 1). A complete sample characterisation is published elsewhere.⁹

EMA responses

We obtained a mean of 27 responses per participant (64% completion rate). Ninety-one per cent of epochs had a non-zero level of suicidal ideation (suicidal ideation: median 7, IQR = 4–11); 37 participants (45%) reported one or more NSSI episodes (median 0, IQR = 0–2).

Suicidal ideation before and concurrent with NSSI

We examined change in suicidal ideation prior to NSSI (in addition to following NSSI) to provide a broader view of NSSI's temporal relationship with suicidal ideation. Mixed-effects models indicated that a 1 point increase in suicidal ideation change from the epoch prior to the epoch concurrent with NSSI ($t - 1$ to t) predicted 15.2% greater odds of NSSI (OR = 1.15, 95% CI 1.11–1.19, $P < 0.001$). Total suicidal ideation concurrent with NSSI (t) predicted greater likelihood of NSSI in that epoch (OR = 1.15, 95% CI 1.12–1.17, $P < 0.001$).

Suicidal ideation following NSSI

Participants reported a mean 1.77 unit reduction (i.e. change) in suicidal ideation following epochs with NSSI, which significantly differed from the mean 0.05 unit increase in suicidal ideation reported following epochs without NSSI (Table 1). To assess whether suicidal ideation change following NSSI may be related to suicidal ideation severity, we compared mean suicidal ideation following epochs with or without NSSI; there were no significant differences.

Discussion

This study is the first to provide evidence for the real-world effect of NSSI on suicidal ideation. Using EMA real-time monitoring in a sample with BPD, our findings demonstrate that NSSI episodes are preceded by increases in suicidal ideation and followed by reductions in suicidal ideation. The short-term ameliorating effect of NSSI on suicidal ideation presents a challenge to suicide prevention since it may encourage repeated self-harm, which in turn significantly escalates risk for future suicidal behaviour.¹ In fact, NSSI is one of the most robust risk factors for suicide, surpassing even prior suicidal behaviour as a predictor of suicide attempts.¹¹ Early intervention for NSSI may be important to reduce the reinforcing

effects of self-injury that contribute to long-term suicide risk. Additionally, our findings suggest that NSSI interventions should address the potential negative consequences of self-injury as a strategy to reduce suicidal ideation, and provide alternative means of regulating suicidal thoughts and urges to self-harm.

For suicidal populations, NSSI may be more likely to function as a coping mechanism for suicidal urges than other common purposes for NSSI, since both behaviours reflect a wish to escape intolerable negative affect. NSSI, however, is oriented towards the temporary alleviation of distress, perhaps as a compromise for the permanent solution that suicide represents.² Self-harm may therefore serve as a stepping stone to suicide attempt and in fact typically emerges prior to first suicide attempt.⁶ When applied to the current sample, risk of transitioning to suicide attempt may be greater for individuals with BPD compared with those with the disorder, since NSSI in this population begins earlier in life and persists later into adulthood. Indeed, individuals with BPD have an alarming 10% rate of completed suicide⁹ and 84% rate of non-fatal suicidal behaviour. These statistics highlight the importance of regarding NSSI in individuals with BPD who present for care in mental health or emergency department settings as an important indicator of potential suicide risk.

This study was not able to determine whether NSSI's mitigating impact on suicidal ideation is a consequence of decreased dysphoria due to NSSI's regulatory effect on mood, since EMA sampling occurred only once every 2 h. This precludes the ability to determine whether reductions in negative affect preceded reductions in suicidal ideation. Nevertheless, our findings provide the first real-world evidence that NSSI is associated with reductions in short-term suicidal ideation. This association may reinforce use of NSSI to manage suicidal states, thus promoting continued self-harm and elevated suicide risk. Future research might seek to clarify mediators of the relationship between NSSI and short-term reduction in suicidal ideation, and their relationships to long-term suicide risk.

Data availability

Data are available on request from the corresponding author, subject to privacy/ethical restrictions.

Sarah Herzog , Department of Psychiatry, Columbia University, New York, New York, USA; **Tse-Hwei Choo**, Molecular Imaging and Neuropathology Division, New York State Psychiatric Institute, New York, USA; **Hanga Galfalvy**, Department of Psychiatry, Columbia University, New York, New York, USA; and Molecular Imaging and Neuropathology Division, New York State Psychiatric Institute, New York, USA; **J. John Mann**, Department of Psychiatry, Columbia University, New York, New York, USA; and Molecular Imaging and Neuropathology Division, New York State Psychiatric Institute, New York, USA; **Barbara H. Stanley** , Department of Psychiatry, Columbia University, New York, New York, USA; and Molecular Imaging and Neuropathology Division, New York State Psychiatric Institute, New York, USA

Correspondence: Sarah Herzog. Email: sarah.herzog@nyspi.columbia.edu

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Author contributions

B.S. and J.J.M. contributed to the design and implementation of the research. B.S. conceived of the presented idea. H.G. and T.-H.C. performed the statistical analyses under supervision of B.S.

S.H. and J.J.M. contributed to interpretation of the results. S.H. wrote the manuscript with support from J.J.M., B.S., H.G. and T.-H.C. All authors discussed the results and contributed to the final manuscript.

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Declaration of interest

None.

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