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To cite this article: Serafine Dierickx, Laurence Claes, Dirk Smits & Glenn Kiekens (04 Aug 2025): Tracking anger at self and others and non-suicidal self-injury cognitions and behavior: an ecological momentary assessment study in emerging adults, *Cognition and Emotion*, DOI: [10.1080/02699931.2025.2536523](https://doi.org/10.1080/02699931.2025.2536523)

To link to this article: <https://doi.org/10.1080/02699931.2025.2536523>



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Published online: 04 Aug 2025.



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Tracking anger at self and others and non-suicidal self-injury cognitions and behavior: an ecological momentary assessment study in emerging adults

Serafine Dierickx ^{a,b}, Laurence Claes ^{a,c,d}, Dirk Smits ^{a,e} and Glenn Kiekens ^{a,f,g}

^aFaculty of Psychology and Educational Sciences, KU Leuven, Leuven, Belgium; ^bResilient People, University Colleges Leuven-Limburg, Leuven, Belgium; ^cFaculty of Medicine and Health Sciences (CAPRI), University of Antwerp, Antwerp, Belgium; ^dChild & Youth Institute, KU Leuven, Leuven, Belgium; ^eOdisee University of Applied Sciences, Brussel, Belgium; ^fDepartment of Neurosciences, Center for Contextual Psychiatry, KU Leuven, Leuven, Belgium; ^gDepartment of Medical and Clinical Psychology, Tilburg University, Tilburg, The Netherlands

ABSTRACT

Although anger is theorised to play a key role in the manifestation of non-suicidal self-injury (NSSI), prospective research in real-world settings is limited. Therefore, the present study examines (1) whether individuals with and without a history of NSSI differ in anger levels in their natural setting and (2) whether heightened self- or other-directed anger predicts NSSI cognitions (i.e. thoughts and self-efficacy to resist NSSI) and behaviour in daily life. Using ecological momentary assessment in 60 emerging adults (ages 18–22) with and without past-year NSSI, participants completed eight daily surveys over 12 days, yielding 4,587 assessments (median compliance = 83.3%; IQR = 71.9–91.7). Emerging adults who used NSSI in the past year reported higher anger at self and others than peers without NSSI history, with higher-than-usual anger at self, but not at others, predicting greater NSSI thought intensity and lower self-efficacy to resist NSSI 90 minutes later. Anger at self also signaled increased risk for NSSI behaviour, but this association became non-significant when controlling for NSSI thoughts. These findings highlight differences in the object of anger between individuals with and without past-year NSSI and underscore the clinical importance of interventions focused on reducing self-directed anger to decrease NSSI thoughts and ultimately prevent self-injury.

ARTICLE HISTORY

Received 19 January 2025
Revised 6 June 2025
Accepted 15 July 2025

KEYWORDS


Non-suicidal self-injury; anger; ecological momentary assessment; negative urgency; cognitions

Non-suicidal self-injury (NSSI) represents a significant public health challenge among emerging adults, with 8.4% of college students worldwide reporting past-year NSSI (Kiekens et al., 2023). Most individuals engage in NSSI for emotion-regulating and self-punishment purposes (Taylor et al., 2018), with the emotion of anger being an important emotional correlate of NSSI. However, few studies to date have prospectively investigated feelings of anger at self or others in daily life among emerging adults who do and do not self-injure. Ecological momentary

assessment (EMA; Shiffman et al., 2008), also known as experience sampling, enables the examination of differences in feelings of anger *between* emerging adults with and without a history of NSSI, while also allowing the investigation of momentary changes in this emotion as a predictor of NSSI-related cognitions and behaviours *within* individuals in daily life.

According to contemporary models of NSSI, both emotional and cognitive processes play a key role in explaining why and when individuals engage in self-injury. The Benefits and Barriers Model (Hooley &

CONTACT Glenn Kiekens  G.kiekens@tilburguniversity.edu  Department of Medical and Clinical Psychology, Tilburg University. Tias building, room T520, Warandelaan 2, 5037 AB, Tilburg, The Netherlands

 Supplemental data for this article can be accessed online at <https://doi.org/10.1080/02699931.2025.2536523>.

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Franklin, 2018) posits that while most individuals can access the potential benefits of NSSI (e.g. emotion regulation), most refrain from engaging in it due to major barriers such as a positive self-concept. Individuals who experience elevated levels of anger, particularly anger directed at the self, may thus be more prone to self-injury, as this emotional state fuels an “affective engine” and aligns with self-punishment motives (Hooley & Franklin, 2018). In a similar vein, the Cognitive-Emotional Model (Hasking et al., 2017) suggests that individuals who engage in NSSI tend to hold negative self-beliefs and expect that NSSI is an effective strategy to regulate distress, with repeated NSSI becoming more likely during moments of intense negative emotion when individuals hold low trust in their ability (i.e. self-efficacy) to resist self-injury.

Between-person associations between anger at self and others and NSSI cognitions and behaviour

Anger is a negative affective state that can be differentiated as directed at self and others (Wranik & Scherer, 2010). Cross-sectional studies suggest that emerging adults who self-injure retrospectively report higher levels of anger at self and others compared to emerging adults without a history of NSSI (e.g. Muehlenkamp et al., 2013). In addition, Victor and Klonsky (2014) found that emerging adults who engaged in NSSI in the past six months retrospectively reported experiencing more anger than those without a history of NSSI. However, this observed difference was considerably smaller when examined in the daily diary component of the same study. While it is often postulated that anger may be a potent emotion predicting NSSI, few prospective studies have examined the association between anger and NSSI (e.g. Dale et al., 2023). In an EMA study, Armev et al. (2011) found that anger was elevated prior to NSSI among participants who engaged in NSSI during the study compared to participants who engaged in NSSI in the past, with levels continuing to increase and peaking at the time NSSI occurred. Further EMA research is needed to differentiate the object of the anger (i.e. anger at self and others) and determine whether individuals with past-year NSSI exhibit higher mean levels of anger at self and others in everyday life compared to those without an NSSI history.

To the best of our knowledge, no EMA studies have investigated associations between anger at self and

others and NSSI cognitions (i.e. NSSI thoughts and self-efficacy to resist NSSI). Hence, it remains unclear whether elevated mean state levels of anger, both directed at self and others, are associated with greater intensity of NSSI cognitions and behaviour among emerging adults with past-year NSSI. Furthermore, when experiencing anger, its expression may also be influenced by the ability to regulate emotions effectively. Trait negative urgency, an individual’s tendency to act impulsively when faced with negative emotions (Claes & Muehlenkamp, 2013), may predict more intense NSSI thoughts, less self-efficacy to resist NSSI, and a higher propensity to engage in NSSI behaviours in everyday life. Therefore, EMA research that considers both NSSI cognitions and behaviours as well as variations in negative urgency is warranted to address these knowledge gaps in the literature.

Within-person associations between anger at self and others and NSSI cognitions and behaviour

Nock et al. (2009) used EMA to examine emotional states and NSSI behaviour among 30 adolescents and young adults, finding that retrospectively reported anger at self or others increased the risk of NSSI behaviour when preceded by NSSI thoughts. Similarly, Dillon et al. (2021) found that general anger predicted heightened NSSI urges and risk of behaviour within six hours among 40 US veterans. However, Kudinova et al. (2024), studying 158 adolescents post-hospitalization who used EMA five times daily before and after school time, found no within-person effects between momentary anger at self or others and NSSI behaviour. Although it is unclear whether the EMA sampling schedule and the relatively lower compliance (41%) contributed to these null findings, Kudinova et al. (2024) did find that adolescents experiencing higher mean levels of anger at self and others reported more NSSI behaviour over the course of three weeks. These mixed findings highlight the need for further research to examine anger at self and others as within-person predictors of NSSI cognitions and behaviours. Drawing from the ideation-to-action framework in the suicide field (Klonsky et al., 2018), distinguishing between NSSI cognitions and behaviour in this risk association may be relevant for both researchers and practitioners as it could inform more targeted interventions for self-injury.

The present study

The present study aimed to address these gaps in the literature using an EMA sampling protocol with eight daily surveys for 12 consecutive days. The first main objective was to examine differences in anger at self and others between individuals with and without past-year NSSI. We hypothesised that individuals with past-year NSSI would report higher mean levels of anger at self (research question 1a) and others (1b) in daily life. Furthermore, we expected higher mean anger levels to correlate with increased NSSI thought intensity, lower self-efficacy to resist NSSI, and NSSI behaviour frequency across the 12-day EMA period (research question 2). Finally, we hypothesised that individuals with past-year NSSI would report higher baseline trait negative urgency (research question 3a) and explored its predictive role for the expression of NSSI cognitions and manifestation of NSSI behaviour in daily life (3b). The second main objective focused on anger as a real-time predictor of NSSI thoughts and behaviours within individuals who self-injure. At the within-person level, we hypothesised that higher-than-usual anger at self (research question 4) and others (research question 5) would contemporaneously and prospectively predict increased NSSI thought intensity and reduced self-efficacy to resist NSSI when controlling for prior NSSI thoughts. Based on prior findings (Nock et al., 2009), we tentatively hypothesised that anger at self and others would also predict NSSI behaviour (research question 6).

Method

Open-science practices

The research plan was post-registered based on a template for EMA studies (Kirtley et al., 2021), with analysis code available on the Open Science Framework (OSF) project of the study (<https://osf.io/w38rb/>).

Procedure and participants

A total of 65 emerging adults (range 18–22 years) initially provided written informed consent to enroll in the study as a follow-up to a university cohort study, with the final sample after eligibility assessment comprising 60 students (81.7% female; $M_{\text{age}} = 19.53$, $SD = 1.28$). As noted elsewhere (Kiekens et al.,

2020, 2024), inclusion criteria for the NSSI group were based on the DSM-5 frequency criteria: NSSI on five or more days in the past year and NSSI urges in the past month (American Psychiatric Association, 2013). The inclusion criteria for the reference group were no lifetime history of NSSI and no prior history of DSM-5 mental disorders. The inclusion criteria were assessed with the Self-Injurious Thoughts and Behaviours Interview (Nock et al., 2007) and the Structured Clinical Interview for DSM-5 (First et al., 2015).

Eligible participants completed a baseline assessment, a 12-day EMA protocol, and a post-assessment one month later (data not used here). The EMA protocol involved eight daily semi-random prompts (9 AM–9 PM) within 90-minute blocks, with prompts spaced at least 15 minutes apart. Responses were required within 15 minutes to reduce recall bias and ensure representative data collection. The entire EMA questionnaire included items assessing emotions, cognitions, social appraisals, NSSI cognitions and behaviours, and other destructive cognitions and behaviours (Kiekens et al., 2020, 2024). Reimbursement was tiered to encourage compliance: €25 for compliance between 25% and 50% or if the post-assessment was incomplete, €50 for 50%–85% compliance, and €75 for over 85% compliance. Ethical approval was obtained from the Social Ethics Committee at KU Leuven.

The sample was split evenly between those with past-year NSSI ($n = 30$) and those without NSSI history ($n = 30$). Participants engaging in NSSI ($M_{\text{age}} = 20.10$, $SD = 1.13$) were, on average, one year older than non-NSSI participants ($M_{\text{age}} = 18.97$, $SD = 1.20$; $t(58) = 3.79$, $p < .001$, Cohen's $d = 0.97$). Most participants (85.0%) identified as heterosexual, while 8.3% identified as bisexual, 5.0% as homosexual/lesbian, and 1.7% as asexual. There were no significant group differences in gender or sexual orientation ($p > .14$). Compliance was high (median = 83.3%, IQR = 71.9–91.7%), yielding 4,587 assessments (76.5 surveys per participant on average, range = 33–95). NSSI and non-NSSI groups did not differ significantly in the number of completed surveys ($t(58) = 1.28$, $p = .205$). The group with past-year NSSI met criteria for a median of two mental disorders in the last 12 months, with DSM-5 anxiety and mood disorders being the most prevalent (33.3%–50.0%). In addition, they reported a median of NSSI on 17.5 days in the past year (range = 5–360 days). The most commonly reported NSSI methods were scratching (86.7%) or

cutting oneself (66.7%) and hitting hands or feet against the wall or other objects (56.7%). For a more detailed clinical description of the NSSI sample, we refer the reader to Kiekens et al. (2020).

Materials

Time-invariant variables measured at baseline

Trait negative urgency was assessed by means of an 11-item Dutch version of the Urgency-Premeditation-Perseverance-Sensation Seeking-Positive Urgency (UPPS-P) Impulsivity Scale (Claes & Muehlenkamp, 2013). Each item (e.g. *"When I feel bad, I will often do things I later regret in order to make myself feel better now"*) is rated on a 4-point Likert scale ranging from 1-*"Strongly agree"* to 4-*"Strongly disagree"*. All items, except one, are reverse-scored. Higher mean scores reflect higher trait negative urgency. The scale demonstrated good internal consistency in prior research ($\alpha = .87$; Claes & Muehlenkamp, 2013) and the current sample ($\alpha = .91$).

Time-variant variables measured during EMA

Momentary anger at self and others were assessed by asking participants at each prompt how much they agreed with the items *"Right now, I am angry at myself"* and *"Right now, I am angry at others"*, respectively. Momentary NSSI thoughts were measured by asking participants whether they agreed with the item *"Right now, I think about self-injuring without suicidal intent"*. The items were rated on a 7-point scale ranging from 0-*"Not at all"* to 6-*"A lot"*. Subsequently, participants were asked whether they had engaged in NSSI with a no[0]/yes[1] item *"Have you self-injured without wanting to die since the last beep?"*. Finally, momentary self-efficacy to resist NSSI was assessed by asking participants to what level they agreed with the item *"How confident are you that you will not engage in NSSI till the next beep?"* using the 7-point scale ranging from 0-*"Not at all"* to 6-*"A lot"*.

Statistical analyses

Analyses were performed using Mplus (version 8.3) and RStudio. Descriptive statistics for the baseline and EMA variables (e.g. average of individual means, standard deviations, intraclass correlation coefficients [ICC]) were calculated as preliminary analyses. To investigate whether individuals with past-year NSSI reported higher trait negative urgency at baseline

than peers without a history of NSSI, a two-sided, two-sample *t*-test was used. The main research questions were examined using Multilevel Vector Autoregressive (MVAR) models within the Dynamic Structural Equation Modeling (DSEM) framework (McNeish & Hamaker, 2020). Residual DSEM models, similar to regular DSEM models, include autoregressive associations but model this through a lagged association between the residuals (Asparouhov & Muthén, 2020). While the former enables the maintenance of the emphasis on contemporaneous relationships within a given time interval, the latter allows for the modelling of temporal relationships between time intervals. To assess whether individuals with past-year NSSI reported higher mean levels of anger at self and others compared to those without a history of NSSI (research question 1), we specified a DSEM model that included past-year NSSI as a between-person predictor of the random effects of the intercepts of anger at self and others. For the second research question, three separate Residual DSEM models were run to investigate between-person associations that were standardised to obtain correlations between mean levels of anger, NSSI thoughts, self-efficacy to resist NSSI, and propensity to engage in NSSI behaviour in the group with past-year NSSI. Next, three DSEM models were implemented to investigate the predictive role of trait negative urgency (grand-mean centred and standardised) as a between-person variable on the mean intensity of NSSI thoughts, self-efficacy to resist NSSI, and propensity to engage in NSSI behaviour across the EMA period among individuals with a past-year history of NSSI (research question 3). For research questions 4 and 5, which focused on within-person associations, we examined whether higher-than-usual levels of anger at self and others were contemporaneously and temporally associated with NSSI thoughts and self-efficacy to resist NSSI within bivariate and multivariate residual and regular DSEM models, respectively. Finally, we investigated whether elevated levels of anger at self and others predicted the propensity to engage in NSSI behaviour using again DSEM models focused on temporal associations, controlling for lagged effects of NSSI thoughts (research question 6).

NSSI cognitions and feelings of anger were measured as continuous variables using Bayesian linear regression, while NSSI behaviour was assessed as a binary variable using Bayesian probit regression. DSEM employs Bayesian estimation with non-

informative priors based on Markov Chain Monte Carlo methods using Gibbs sampling. A 90-minute transformed time interval was specified to account for unequally spaced intervals due to missing data and random sampling within blocks (McNeish & Hamaker, 2020). The models included random intercepts and fixed slopes for momentary variables, and residual variances were allowed to be person-specific when possible. Given that treating covariates as exogenous variables may yield biased estimates, autoregressive effects of all state variables were included in all models. Point estimates for associations were obtained by taking each parameter's median from the posterior distribution. Statistical significance was determined by estimating 95% credibility intervals around each point estimate. If the interval excludes 0, it indicates a 95% probability that the true value differs from null.

Results

Preliminary analyses

Across the sample, the average of participant-specific means for anger at self was 0.73 ($SD = 0.95$) on a 0–6 scale, while this was 0.44 ($SD = 0.53$) for anger at others. The 30 emerging adults with past-year NSSI reported an overall mean intensity of 0.73 ($SD = 1.05$) on a 0–6 scale for NSSI thoughts and 4.73 ($SD = 1.45$) for self-efficacy to resist NSSI. NSSI behaviour was reported at least once by 53.3% of those with past-year NSSI ($n = 16$), with a mean of 10.44 NSSI behaviours ($SD = 10.66$, range: 1–37) across the 12 days (i.e. 5.57 times on average among the entire NSSI subsample). The variance in anger at self was distributed equally between and within individuals ($ICC = 0.50$). The ICC for anger at others was 0.26, indicating that most variability was situated within individuals over time. Supplementary Figure 1 illustrates fluctuations in feelings of anger on an hourly basis for randomly selected individuals with and without past-year NSSI.

Between-person associations between anger at self and others and NSSI cognitions and behaviour

Over the 12-day EMA period, individuals with past-year NSSI reported a higher mean intensity of anger at self (slope = 0.99, 95%CrI = 0.56–1.40) and others (slope = 0.44, 95%CrI = 0.22–0.68) compared to those

without past-year NSSI (intercepts = 0.23 and 0.19, respectively; see Supplementary Table 1). Among the subsample with past-year NSSI, we found that reporting a higher mean intensity of anger at self was strongly positively associated ($r = 0.77$, 95%CrI = 0.54–0.89) with mean intensity of NSSI thoughts and negatively associated ($r = -0.56$, 95%CrI = -0.78 to -0.22) with mean intensity of self-efficacy to resist NSSI. Conversely, no between-person associations with NSSI cognitions were significant for anger at others (see Supplementary Table 2). Emerging adults with a past-year history of NSSI who reported higher levels of anger at others reported fewer NSSI behaviours across the 12 days of EMA ($r = -0.47$, 95%CrI = -0.78 to -0.01).

Individuals with past-year NSSI reported higher trait negative urgency ($M = 26.97$, $SD = 6.90$) than those without a history of NSSI ($M = 16.97$, $SD = 4.74$, $t(58) = 6.55$, $p < .001$, Cohen's $d = 1.69$). Among individuals with past-year NSSI, trait negative urgency was not a significant predictor of mean intensity levels of NSSI thoughts (slope = 0.30, 95% CrI = -0.09–0.69), self-efficacy to resist NSSI (slope = -0.25, 95% CrI = -0.81–0.33), or the propensity to self-injure (slope = -0.09, 95% CrI = -0.76–0.68) across the course of 12 days.

Within-person associations between anger at self and others and NSSI cognitions and behaviour

Next, we investigated the within-person associations between angry at self or others and NSSI cognitions (Table 1). This revealed that higher-than-usual feelings of anger at self (slope = 0.05, 95% CrI = 0.02–0.08) or others (slope = 0.04, 95% CrI = 0.01–0.08) were associated with increased momentary NSSI thoughts within the same assessment. In a multivariate model that included both objectives of anger (i.e. at self and others), only the contemporaneous association for anger at self remained significantly related to momentary NSSI thoughts (Table 1). Conversely, higher-than-usual feelings of anger at self (slope = -0.08, 95% CrI = -0.12 to -0.04), but not at others, were associated with lower momentary self-efficacy to resist NSSI. Considering temporal associations (Table 1), we found evidence that feeling angry at self, but not at others, uniquely predicted increased NSSI thoughts (slope = 0.04, 95% CrI = 0.01–0.06) and lower self-efficacy (slope = -0.04, 95% CrI = -0.07 to -0.01) to resist in the subsequent 90 min.

Table 1. Anger at self and others as contemporaneous and temporal real-time predictors of NSSI cognitions.

Within-person predictors	Contemporaneous prediction NSSI thoughts ($n = 27, i = 1,978$ Assessments)		Contemporaneous prediction NSSI self-efficacy ($n = 26, i = 1,924$ Assessments)	
	Bivariate model ^a : NSSI Thoughts _T <i>B</i> (95% CrI)	Multivariate model ^b : NSSI Thoughts _T <i>B</i> (95% CrI)	Bivariate model ^a : Self-efficacy to resist NSSI _T <i>B</i> (95% CrI)	Multivariate model ^b : Self-efficacy to resist NSSI _T <i>B</i> (95% CrI)
Momentary anger at self _T	0.05 (0.02, 0.08)	0.05 (0.01, 0.08)	-0.08 (-0.12, -0.04)	-0.08 (-0.12, -0.04)
Momentary anger at others _T	0.04 (0.01, 0.08)	0.03 (-0.01, 0.07)	-0.01 (-0.09, 0.07)	-0.01 (-0.08, 0.07)
Within-person predictors	Temporal prediction NSSI thoughts ($n = 27, i = 1,978$ Assessments)		Temporal prediction NSSI self-efficacy ($n = 26, i = 1,924$ Assessments)	
	Bivariate model ^a : NSSI Thoughts _T <i>B</i> (95% CrI)	Multivariate model ^b : NSSI Thoughts _T <i>B</i> (95% CrI)	Bivariate model ^a : Self-efficacy to resist NSSI _T <i>B</i> (95% CrI)	Multivariate model ^b : Self-efficacy to resist NSSI _T <i>B</i> (95% CrI)
Momentary anger at self _{T-1}	0.04 (0.02, 0.06)	0.04 (0.01, 0.06)	-0.04 (-0.08, -0.02)	-0.04 (-0.07, -0.01)
Momentary anger at others _{T-1}	0.02 (-0.003, 0.05)	0.01 (-0.01, 0.04)	-0.05 (-0.09, -0.002)	-0.04 (-0.09, 0.01)

Note: ^aEach cell represents the results of a bivariate multilevel vector autoregressive model with the autoregressive parameter of the outcome included (not shown here). ^bEach multivariate model represents the results of a multivariate multilevel vector autoregressive model with the autoregressive parameter of the outcome included (not shown here) and the anger variable(s) mentioned in the rows as predictors. Boldface for within-person effects indicates a 95% probability that the true value of the effect is not null (i.e. the credibility interval does not include zero). *B* = Median Point Estimate, 95% CrI = 95% Credibility Interval, NSSI = Non-Suicidal Self-Injury.

Table 2. Anger at self and others as temporal real-time predictors of NSSI behaviour.

Within-person predictors	NSSI Behaviour Prediction ($n = 16, i = 1,151$ Assessments)		
	Model 1: Behaviour _T <i>B</i> (95% CrI)	Model 2: Behaviour _T (Controlling for Behaviour _{T-1}) <i>B</i> (95% CrI)	Model 3: Behaviour _T (Controlling for Behaviour _{T-1} and NSSI Thought intensity _{T-1}) <i>B</i> (95% CrI)
Momentary anger at self _{T-1}	0.12 (0.02, 0.22)	0.11 (0.01, 0.20)	0.05 (-0.06, 0.15)
NSSI Behaviour _{T-1}	-	0.23 (0.06, 0.39)	0.09 (-0.09, 0.25)
NSSI Thoughts _{T-1}	-	-	0.21 (0.10, 0.32)
Within-person predictors	NSSI Behaviour Prediction ($n = 16, i = 1,151$ Assessments)		
	Model 1: Behaviour _T <i>B</i> (95% CrI)	Model 2: Behaviour _T (Controlling for Behaviour _{T-1}) <i>B</i> (95% CrI)	Model 3: Behaviour _T (Controlling for Behaviour _{T-1} and NSSI Thought intensity _{T-1}) <i>B</i> (95% CrI)
Momentary anger at others _{T-1}	0.06 (-0.08, 0.19)	0.04 (-0.10, 0.18)	-0.02 (-0.17, 0.13)
NSSI Behaviour _{T-1}	-	0.24 (0.07, 0.40)	0.08 (-0.09, 0.25)
NSSI Thoughts _{T-1}	-	-	0.23 (0.12, 0.34)

Note: Each column of a model represents the results of a multilevel vector autoregressive model. These models include the specific variable(s) mentioned in the rows as a predictor of NSSI behaviour. Boldface for within-person effects indicates a 95% probability that the true value of the effect is not null (i.e. the credibility interval does not include zero). *B* = Median Point Estimate, 95% CrI = 95% Credibility Interval, NSSI = Non-Suicidal Self-Injury.

Finally, we investigated the within-person associations between anger at self or others and NSSI behaviour (Table 2). This analysis indicated that higher-than-usual feelings of anger at self (slope = 0.11, 95% CrI = 0.01–0.20) incrementally predicted risk of NSSI behaviour in the following 90 min, above and beyond the autoregressive effect of prior self-injury (slope = 0.23, 95% CrI = 0.06–0.39). However, our analyses suggest that this emotional state is not a unique direct predictor of NSSI behaviour, as this association became non-significant

when controlling for the intensity of NSSI thoughts at the previous assessment (slope = 0.21, 95% CrI = 0.10–0.32). There was no significant temporal association for anger at others in the models predicting NSSI behaviour (Table 2).

Discussion

This brief report investigated associations between anger at self and others and NSSI cognitions and behaviours among emerging adults with and

without past-year NSSI. Three main findings stand out and warrant further comment. First, we found evidence that individuals with past-year NSSI experience higher levels of anger, both at self and others, than those without a history of NSSI. Second, higher-than-usual anger at self, but not anger at others, is a real-time predictor of greater intensity of NSSI thoughts and lower self-efficacy to resist NSSI on a time scale of 90 min. Third, while anger at self also prospectively increased the risk of NSSI behaviour beyond prior self-injury, this association disappeared when controlling for NSSI thoughts, suggesting an indirect pathway to NSSI behaviour. Each of these findings holds clinical implications and points toward the relevance of addressing anger at self in interventions for NSSI.

First, our findings indicate that individuals with a history of past-year NSSI report higher levels of anger at self and others in daily life compared to peers without a history of NSSI. These results provide ecological support for prior cross-sectional research demonstrating positive associations between NSSI history and both anger at self and others (e.g. Muehlenkamp et al., 2013). Extending prior EMA research, which either did not distinguish between the object of anger (Dillon et al., 2021) or did not investigate NSSI-related cognitions (Kudinova et al., 2024), we found that elevated levels of anger at self – but not anger at others – were associated with more intense NSSI thoughts, reduced self-efficacy to resist NSSI, and a greater likelihood of NSSI behaviour. These findings suggest that emerging adults who self-injure not only experience higher levels of anger at self than their peers but also that this is linked to the intensity of NSSI-related cognitions and the occurrence of self-injury in daily life. This supports the role of anger at the self in theories of NSSI (Hooley & Franklin, 2018), which maps onto work showing that individuals may engage in NSSI to regulate emotions and fulfill self-punishment desires (Taylor et al., 2018).

Somewhat unexpectedly, individuals with higher levels of anger at others reported fewer NSSI behaviours during the EMA period. One possible explanation is that emerging adults experiencing greater anger at others may cope through externalising behaviours, such as verbal arguments, confrontations, or substance use, rather than engaging in NSSI. Although we observed momentary associations between anger at others and NSSI cognitions, these became non-significant when controlling for anger at self. This suggests that other-directed feelings of

anger may not directly contribute to NSSI, but could potentially operate indirectly and, in the absence of effective regulation strategies, become redirected at the self.¹ This would align with Blatt's (2008) theory of introjection, which posits that individuals may initially experience anger at others but eventually turn that anger inward. Such a within-person mechanism may be especially relevant for individuals who struggle to express anger or perceive doing so as socially unacceptable. Future prospective research should investigate the pathways through which anger at others may elevate risk for NSSI. Contrary to prior cross-sectional work (Hamza et al., 2015), we found no association between trait negative urgency and NSSI cognitions and behaviours in daily life. Scholars have argued that global self-reports of trait negative urgency may not be sensitive enough to predict impulsive behaviours in real-time (Feil et al., 2020), with calls made for a state-level measure (King et al., 2025). Further research is thus needed to replicate and extend these findings.

Second, a novel finding of our study was that when emerging adults with past-year NSSI experienced more anger at self, this was contemporaneously associated with higher intensity of NSSI thoughts and lower self-efficacy to resist NSSI. These results support and extend two recent studies investigating associations between feeling angry and NSSI urges (Dillon et al., 2021; Weatherford et al., 2024). For instance, Weatherford and colleagues (2024) recently found that elevated levels of anger were associated with heightened NSSI urge intensity on the same day among individuals with borderline personality disorder. Importantly, the present findings show that elevated anger at self also prospectively incrementally predicts increases in the intensity of NSSI thoughts and reductions in self-efficacy to resist NSSI over a 90-minute interval beyond autoregressive effects. These findings highlight the potential benefit of interventions that foster self-compassionate appraisals rather than anger at self in individuals with NSSI. Such interventions may help challenge negative self-perceptions and promote more adaptive emotional responses.

Finally, it was found that anger at self functions as a real-time risk factor for NSSI behaviour among emerging adults, aligning with prior EMA research among US veterans (Dillon et al., 2021). However, our results provide preliminary evidence that higher-than-usual feelings of anger at self might not uniquely increase the risk of NSSI behaviour, as this risk association disappeared when also controlling for NSSI thoughts at

the previous assessment. Instead, anger at self may indirectly heighten risk through its prospective effect on NSSI thought intensity and reduced self-efficacy to resist NSSI among individuals with a history of NSSI. If confirmed, these findings would align with an ideation-to-action framework (Klonsky et al., 2018), indicating that while anger at self may catalyze ideation of NSSI behaviours, it may not uniquely drive the transition to action. The progression from NSSI thoughts to behaviour likely involves additional factors. For example, the Barriers and Benefits Model (Hooley & Franklin, 2018) highlights that beliefs, such as feeling “deserving of pain”, may influence action on thoughts. Future EMA studies employing burst sampling during high-risk periods are needed to improve our understanding of emotional and cognitive factors that influence the progression from NSSI ideation to behaviour.

Limitations and future research directions

Several limitations should be noted when interpreting the findings of this EMA study. First, we included 60 emerging adults attending college, with 82% identifying as women and 85% as heterosexual. This may limit the generalizability of the findings, and future research should aim to replicate the study in larger, more diverse populations, including individuals with varied gender identities, sexual orientations, ethnic backgrounds, and those not enrolled in higher education. In addition, while we intentionally aimed to keep the reference group as uniform as possible by including emerging adults without a history of NSSI and any prior mental disorders, it is likely that comorbid psychopathology (e.g. cognitive biases among depressed individuals who self-injure) partially explains the observed between-group differences in the mean intensity levels of anger at self and others. Future large-scale cohort studies that incorporate EMA are warranted to disentangle the unique contribution of NSSI beyond comorbid psychopathology.

Second, the models used in this study included fixed slopes, assuming that the strength of the associations between anger at self and others and NSSI cognitions and behaviour is consistent across individuals. EMA studies with larger samples should explore variability in these associations through random slopes. This would also enable exploration of whether the object of anger varies by NSSI method, such as cutting versus wall-punching (Kimbrel et al., 2018). Finally, the temporal analyses were conducted at

intervals of 90 min, which may not fully capture the rapid fluctuations in emotional states such as anger. Future research could benefit from employing even denser sampling schedules to track the sequence of situations, thoughts, and emotions leading up to NSSI behaviours in daily life.

Clinical implications

Despite these limitations, the findings of this study offer several clinical insights for practitioners working with individuals who engage in NSSI. The identification of anger at self as a precursor to NSSI thoughts and reduced efficacy to resist NSSI highlights the importance of Cognitive Behavioural Therapy (CBT) interventions that target anger regulation and foster self-compassion. Additionally, Dialectical Behaviour Therapy (DBT) could equip individuals with skills to manage distress and regulate feelings of anger through techniques such as chain analysis and skills training (Chapman et al., 2023). Digital interventions, including DBT-based apps and ecological momentary interventions (EMIs), also show promise for addressing self-directed anger in real time (Kruzan et al., 2024). These tools can combine mood tracking with EMA while offering emotion-regulation exercises, providing support when feeling self-directed anger to avoid the development of NSSI thoughts and enhancing individuals’ capacity to resist NSSI when experiencing NSSI thoughts. For instance, by detecting momentary increases in anger at the self, these tools could prompt individuals to engage in self-compassion exercises before individuals are at acute risk of making the transition from NSSI thoughts to behaviour. However, to the best of our knowledge such tools are not yet available, highlighting an important avenue for future research. Specifically, exploring the perspectives of individuals who self-injure regarding the use of EMA and EMIs for NSSI could guide the development of these interventions.

Conclusion

The present EMA study underscores notable differences in the expression of anger between emerging adults with and without a history of NSSI, while identifying anger at self as a real-time risk factor for NSSI cognitions and behaviour in daily life. These findings highlight the critical need for interventions targeting self-directed anger to reduce the risk of NSSI among young individuals.

Note

1. In response to a reviewer comment, we conducted post-hoc analyses examining temporal associations between anger at self and others in both groups. Among individuals with past-year NSSI, anger at others predicted subsequent increases in anger at self (slope = 0.08, 95% CrI = 0.03–0.13), with the reverse direction also observed (slope = 0.11, 95% CrI = 0.09–0.13). No temporal associations beyond autoregressive effects were found among individuals without a history of NSSI.

Disclosure statement

No potential conflict of interest was reported by the author(s).

Funding

GK received funding for this study from the Research Foundation Flanders (1204924N/12ZZM21N).

Data availability statement

The data supporting the findings of this study are available from the corresponding author upon reasonable request and after signing a data-sharing agreement.

ORCID

Serafine Dierickx  <http://orcid.org/0000-0001-9406-8919>
 Laurence Claes  <http://orcid.org/0000-0002-2287-3158>
 Dirk Smits  <http://orcid.org/0000-0001-5542-3252>
 Glenn Kiekens  <http://orcid.org/0000-0001-8747-3385>

References

- American Psychiatric Association. (2013). *Diagnostic and statistical manual of mental disorders* (5th ed.). American Psychiatric Publishing, Inc. <https://doi.org/10.1176/appi.books.9780890425596>
- Armey, M. F., Crowther, J. H., & Miller, I. W. (2011). Changes in ecological momentary assessment reported affect associated with episodes of nonsuicidal self-injury. *Behavior Therapy, 42*(4), 579–588. <https://doi.org/10.1016/j.beth.2011.01.002>
- Asparouhov, T., & Muthén, B. (2020). Comparison of models for the analysis of intensive longitudinal data. *Structural Equation Modeling: A Multidisciplinary Journal, 27*(2), 275–297. <https://doi.org/10.1080/10705511.2019.1626733>
- Blatt, S. J. (2008). Relatedness and self-definition in personality development. In S. J. Blatt (Ed.), *Polarities of experience: Relatedness and self-definition in personality development, psychopathology, and the therapeutic process* (pp. 71–98). American Psychological Association. <https://doi.org/10.1037/11749-003>
- Chapman, A. L., Hood, P., & Turner, C. J. (2023). Cognitive-behavioral and dialectical behavior therapy for nonsuicidal self-injury. In E. E. Lloyd-Richardson, I. Baetens, & J. L. Whitlock (Eds.), *The Oxford Handbook of nonsuicidal self-injury* (Online ed., pp. 1112–1126). Oxford University Press. <https://doi.org/10.1093/oxfordhb/9780197611272.013.55>
- Claes, L., & Muehlenkamp, J. (2013). The relationship between the UPPS-P impulsivity dimensions and nonsuicidal self-injury characteristics in male and female high-school students. *Psychiatry Journal, 2013*, 1–5. <https://doi.org/10.1155/2013/654847>
- Dale, K., Case, J. A., Dyson, M. W., Klein, D. N., & Olino, T. M. (2023). Childhood temperament as a predictor of adolescent nonsuicidal self-injury. *Development and Psychopathology, 35*(3), 1288–1295. <https://doi.org/10.1017/S095457942100119X>
- Dillon, K. H., Glenn, J. J., Dennis, P. A., LoSavio, S. T., Cassiello-Robbins, C., Gromatsky, M. A., Beckham, J. C., Calhoun, P. S., & Kimbrel, N. A. (2021). Anger precedes and predicts nonsuicidal self-injury in veterans: Findings from an ecological momentary assessment study. *Journal of Psychiatric Research, 135*, 47–51. <https://doi.org/10.1016/j.jpsy.2021.01.011>
- Feil, M., Halvorson, M., Lengua, L., & King, K. M. (2020). A state model of negative urgency: Do momentary reports of emotional impulsivity reflect global self-report? *Journal of Research in Personality, 86*, 103942. <https://doi.org/10.1016/j.jrp.2020.103942>
- First, M. B., Williams, J. B., Karg, R. S., & Spitzer, R. L. (2015). *Structured clinical interview for DSM-5 – Research version (SCID-5-RV)*. American Psychiatric Association.
- Hamza, C. A., Willoughby, T., & Heffer, T. (2015). Impulsivity and nonsuicidal self-injury: A review and meta-analysis. *Clinical Psychology Review, 38*, 13–24. <https://doi.org/10.1016/j.cpr.2015.02.010>
- Hasking, P., Whitlock, J., Voon, D., & Rose, A. (2017). A cognitive-emotional model of NSSI: Using emotion regulation and cognitive processes to explain why people self-injure. *Cognition and Emotion, 31*(8), 1543–1556. <https://doi.org/10.1080/02699931.2016.1241219>
- Hooley, J. M., & Franklin, J. C. (2018). Why do people hurt themselves? A new conceptual model of nonsuicidal self-injury. *Clinical Psychological Science, 6*(3), 428–451. <https://doi.org/10.1177/2167702617745641>
- Kiekens, G., Hasking, P., Bruffaerts, R., Alonso, J., Auerbach, R. P., Bantjes, J., Benjet, C., Boyes, M., Chiu, W. T., Claes, L., Cuijpers, P., Ebert, D. D., Mak, A., Mortier, P., O'Neill, S., Sampson, N. A., Stein, D. J., Vilagut, G., Nock, M. K., & Kessler, R. C. (2023). Nonsuicidal self-injury among first-year college students and its association with mental disorders: Results from the World Mental Health International College Student (WMH-ICS) initiative. *Psychological Medicine, 53*(3), 875–886. <https://doi.org/10.1017/S0033291721002245>
- Kiekens, G., Hasking, P., Nock, M. K., Boyes, M., Kirtley, O., Bruffaerts, R., Myin-Germeys, I., & Claes, L. (2020). Fluctuations in affective states and self-efficacy to resist non-suicidal self-injury as real-time predictors of non-suicidal self-injurious thoughts and behaviors. *Frontiers in Psychiatry, 11*, 1–13. <https://doi.org/10.3389/fpsy.2020.00214>
- Kiekens, G., Hasking, P., Nock, M. K., Kleiman, E., Kirtley, O. J., Houben, M., Boyes, M., Bruffaerts, R., Myin-Germeys, I., & Claes, L. (2024). A comparison of affective-cognitive states in daily life between emerging adults with and without past-year nonsuicidal self-injury. *Behavior Therapy, 55*(3), 469–484. <https://doi.org/10.1016/j.beth.2023.08.004>

- Kimbrel, N. A., Thomas, S. P., Hicks, T. A., Hertzberg, M. A., Clancy, C. P., Elbogen, E. B., Meyer, E. C., DeBeer, B. B., Gross, G. M., Silvia, P. J., Morissette, S. B., Gratz, K. L., Calhoun, P. S., & Beckham, J. C. (2018). Wall/object punching: An important but under-recognized form of nonsuicidal self-injury. *Suicide and Life-Threatening Behavior*, 48(5), 501–511. <https://doi.org/10.1111/sltb.12371>
- King, K. M., Feil, M. C., Gomez Juarez, N., Moss, D., Halvorson, M. A., Dora, J., Upton, N. F., Bryson, M. A., Seldin, K., Shoda, Y., Lee, C. M., & Smith, G. T. (2025). Negative urgency as a state-level process. *Journal of Personality*, 93(3), 529–552. <https://doi.org/10.1111/jopy.12961>
- Kirtley, O. J., Lafit, G., Achterhof, R., Hiekkaranta, A. P., & Myin-Germeys, I. (2021). Making the black box transparent: A template and tutorial for registration of studies using experience-sampling methods. *Advances in Methods and Practices in Psychological Science*, 4(1), 1–16. <https://doi.org/10.1177/2515245920924686>
- Klonsky, E. D., Saffer, B. Y., & Bryan, C. J. (2018). Ideation-to-action theories of suicide: A conceptual and empirical update. *Current Opinion in Psychology*, 22, 38–43. <https://doi.org/10.1016/j.copsyc.2017.07.020>
- Kruzan, K. P., Biernesser, C., Hoffmann, J. A., & Meyerhoff, J. (2024). Digital interventions for adolescents and young adults experiencing self-injurious thoughts and behaviors. *Current Treatment Options in Psychiatry*, 11(2), 76–89. <https://doi.org/10.1007/s40501-024-00318-9>
- Kudinova, A. Y., Brick, L. A., Armev, M., & Nugent, N. R. (2024). Micro-sequences of anger and shame and non-suicidal self-injury in youth: An ecological momentary assessment study. *Journal of Child Psychology and Psychiatry*, 65(2), 137–147. <https://doi.org/10.1111/jcpp.13869>
- McNeish, D., & Hamaker, E. L. (2020). A primer on two-level dynamic structural equation models for intensive longitudinal data in Mplus. *Psychological Methods*, 25(5), 610–635. <https://doi.org/10.1037/met0000250>
- Muehlenkamp, J., Brausch, A., Quigley, K., & Whitlock, J. (2013). Interpersonal features and functions of nonsuicidal self-injury. *Suicide and Life-Threatening Behavior*, 43(1), 67–80. <https://doi.org/10.1111/j.1943-278X.2012.00128.x>
- Nock, M. K., Holmberg, E. B., Photos, V. I., & Michel, B. D. (2007). Self-injurious thoughts and behaviors interview: Development, reliability, and validity in an adolescent sample. *Psychological Assessment*, 19(3), 309–317. <https://doi.org/10.1037/1040-3590.19.3.309>
- Nock, M. K., Prinstein, M. J., & Sterba, S. K. (2009). Revealing the form and function of self-injurious thoughts and behaviors: A real-time ecological assessment study among adolescents and young adults. *Journal of Abnormal Psychology*, 118(4), 816–827. <https://doi.org/10.1037/a0016948>
- Shiffman, S., Stone, A. A., & Hufford, M. R. (2008). Ecological momentary assessment. *Annual Review of Clinical Psychology*, 4(1), 1–32. <https://doi.org/10.1146/annurev.clinpsy.3.022806.091415>
- Taylor, P. J., Jomar, K., Dhingra, K., Forrester, R., Shahmalak, U., & Dickson, J. M. (2018). A meta-analysis of the prevalence of different functions of non-suicidal self-injury. *Journal of Affective Disorders*, 227, 759–769. <https://doi.org/10.1016/j.jad.2017.11.073>
- Victor, S. E., & Klonsky, E. D. (2014). Daily emotion in non-suicidal self-injury. *Journal of Clinical Psychology*, 70(4), 364–375. <https://doi.org/10.1002/jclp.22037>
- Weatherford, J. V., Ruork, A. K., Yin, Q., Lopez, A. C., & Rizvi, S. L. (2024). Shame, suicidal ideation, and urges for non-suicidal self-injury among individuals with borderline personality disorder receiving dialectical behavior therapy: The mediating role of anger. *Suicide and Life-Threatening Behavior*, 54(2), 338–348. <https://doi.org/10.1111/sltb.13045>
- Wranik, T., & Scherer, K. R. (2010). Why do I get angry? A componential appraisal approach. In M. Potegal, G. Stemmler, & C. Spielberger (Eds.), *International handbook of anger: Constituent and concomitant biological, psychological, and social processes* (pp. 243–266). Springer New York. https://doi.org/10.1007/978-0-387-89676-2_15