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Research paper

Examining momentary associations between behavioral approach system indices and nonsuicidal self-injury urges

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ABSTRACT

Background: The current study aimed to examine the concurrent and prospective relationships between the three hypothesized components of behavioral approach system (BAS) sensitivity: drive, reflecting the motivation to pursue one's desired goals; reward responsiveness, reflecting sensitivity to reward or reinforcement; and fun-seeking, reflecting the motivation for pursuing novel rewards in a spontaneous manner, and NSSI urge severity.
Methods: A sample of 64 undergraduates with a history of repetitive NSSI completed an ecological momentary assessment protocol. During this period of time, participants reported on the BAS-constructs of drive, reward responsiveness, and fun-seeking, as well as NSSI urge severity on a momentary basis at three random intervals each day for a period of ten-days.
Results: Drive and reward responsiveness, but not fun-seeking, were concurrently positively associated with NSSI urge severity. However, no associations between BAS facets and prospective NSSI urges were found.
Limitations: This study was limited by its use of single items to assess the BAS-constructs of drive, reward responsiveness, and fun-seeking.
Conclusions: Our findings indicate that feeling strongly impacted by rewards and having a strong sense of drive toward goal attainment may represent cognitive risk states that are associated with increased within-person NSSI risk. However, their lack of prospective prediction may suggest that these cognitive states are associated only on a momentary basis with NSSI urges and may not confer risk.

1. Introduction

Nonsuicidal self-injury (NSSI) is defined as the deliberate, self-inflicted damage of body tissue without suicidal intent and for purposes not socially sanctioned (International Society for the Study of Self-injury, 2018). NSSI in college students is an international concern, with a recent cross-national survey finding that 17.7% of college freshman report a lifetime history of NSSI and 8.4% report a past year history (Kiekens et al., 2021). Evidence suggests that the prevalence rate of NSSI among college students has demonstrated significant increases in recent years (Duffy et al., 2019; Wester et al., 2018). Notably, beyond the direct physical and emotional consequences, even one act of lifetime NSSI increases the odds of future suicidal behavior (Ribeiro et al., 2016). In efforts to predict and prevent NSSI engagement, NSSI urges may be particularly useful as a target. Among individuals with a history of NSSI, the urge or desire to engage in NSSI is a common experience (e.g., Turner et al., 2019) and prior ecologically valid and longitudinal studies strongly suggest that NSSI urges temporally precede and predict engagement in NSSI (Ammerman et al., 2017b; Hepp et al., 2020; Nock et al., 2009; Turner et al., 2019; Washburn et al., 2010). Despite this direct link to NSSI behavior, and opportunity for targeted prevention and intervention efforts among college students and emerging adults, NSSI urges have been relatively understudied.

Mounting evidence supports that NSSI is maintained through both negative reinforcement (i.e., reduction of aversive intrapersonal / interpersonal experiences) and positive reinforcement (i.e., increases in positive intrapersonal / interpersonal experiences) (e.g., Hepp et al., 2020). The behavioral approach system (BAS) is hypothesized to

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regulate incentive motivation and approach or goal-oriented behavior (Carver and White, 1994; Pickering and Gray, 2001). Theory suggests that this biobehavioral system underlies reward reinforcement (Pickering and Gray, 2001), and thus, may play a role in maintaining reinforcing behaviors. Indeed, it is plausible that hypersensitivity to the reinforcing properties of NSSI not only may motivate the behavior, but also may underlie the presence and severity of urges to engage in this behavior, particularly once such rewards are conditioned. In line with this conjecture, empirical evidence suggests that reward sensitivity is positively associated with frequency of NSSI (Burke et al., 2015; Cerutti et al., 2012; Robertson et al., 2013) and number of NSSI methods employed (Jenkins et al., 2013). However, some contradictory evidence exists. Jenkins and colleagues (2013) found no significant differences between those with and without a history of NSSI on facets of BAS or on a distinct measure of reward sensitivity; the authors also concluded that the reward responsiveness subscale of the BAS predicted *fewer* lifetime acts of NSSI. More recently, it has been suggested that mutual correlates of reward sensitivity and NSSI account for the reward sensitivity/BAS – NSSI relationship a (Ammerman et al., 2017a), such that despite findings that reward sensitivity was positively related to NSSI history, after adjusting for demographic factors and NSSI-related risk factors (e.g., anxiety, depressive symptomatology, impulsivity, substance use), group differences were no longer significant.

Mixed findings pertaining to the relationship between BAS and NSSI may be due to limitations in study designs, the majority of which have utilized retrospective or cross-sectional measures, which are prone to recall biases. Despite the advantages of examining predictors and outcomes in real-time, there have been limited studies investigating BAS features in this manner. Indeed, the majority of studies that have utilized ecological momentary assessment (EMA) to examine momentary, or real-time, relationships between BAS or reward sensitivity and psychological outcomes largely have focused on baseline assessments of BAS or reward sensitivity predicting daily behavior occurrences (e.g., Goldschmidt et al., 2019). This methodology, however, fails to capture potential daily variations in BAS sensitivity. Prior research has demonstrated that reward-based learning may be influenced by momentary emotional states (Dixon-Gordon et al., 2018; Dour et al., 2011), highlighting the need to measure the construct in a fashion (i.e., at a momentary level) that captures changes due to mood state. Few studies have assessed elements of BAS within EMA study designs directly to allow for this variability to be modeled and, to our knowledge, no studies to date have done so to examine the BAS – NSSI relationship. Thus, no studies have examined the relationship between BAS components and NSSI from a within-person perspective. Furthermore, prior research aimed at elucidating the role of BAS sensitivity in reinforcing behaviors (e.g., alcohol consumption) has found evidence supporting the role of BAS in behavioral urges (e.g., cravings) (Franken, 2002). Although NSSI urge severity serves as a proximal predictor of NSSI behavior, and the urge to engage in behavior is inherently linked to reinforcement processes, no studies have examined the association between BAS elements and NSSI urge presence or severity in real-time.

1.1. Current study

The current study aimed to examine the concurrent and prospective relationships between the three hypothesized components of BAS sensitivity: drive, reflecting the motivation to pursue one's desired goals; reward responsiveness, reflecting sensitivity to reward or reinforcement; and fun-seeking, reflecting the motivation for pursuing novel rewards in a spontaneous manner (Carver and White, 1994), and NSSI urge presence and severity with an EMA study design. Given evidence suggesting greater BAS sensitivity may augment the reinforcing properties of NSSI behaviors, and the strong link between NSSI urges and behavior, we hypothesized that we would observe significant positive within-person concurrent and prospective relationships of all three BAS subtypes with NSSI urge presence and severity.

2. Methods

2.1. Participants

The present analytic sample was drawn from a larger sample of 123 undergraduate students from Temple University who completed an EMA study. Approximately half of the sample was recruited for having a lifetime history of repetitive NSSI ($n = 64$) and half of the sample was recruited as a control group without a history of engagement in NSSI ($n = 59$). Participants in the repetitive NSSI group (NSSI+ group) were required to have engaged in a minimum of two NSSI acts across their lifetime, which was determined by self-report and a clinician-rated interview. Participants in both groups were required to have normal or corrected vision, access to a smartphone, and endorse fluency in English. The current sample employs only the 64 NSSI+ group participants. Participants were between the ages of 18–26 ($M = 20.05$ years; $SD = 2.04$) and were 92.2% female. Approximately 70.3% of the sample identified as White ($n = 45$), 18.8% as Asian ($n = 12$), 0% as Black ($n = 0$), 3.1% as Other ($n = 2$), 6.3% ($n = 4$) as more than one race, and 1.6% ($n = 1$) preferred not to answer. Approximately 9.4% ($n = 6$) of the sample identified as Hispanic. No participants were excluded based on clinical or demographic variables.

2.2. Procedure

Participants were recruited through the university's Psychology Research Participation System, "Sona Systems," which facilitates research participation for students in introductory psychology classes, as well as through posting flyers on campus. Interested participants completed an online consent form and a brief screener on the online survey system, Qualtrics, to determine if they met the inclusion criteria for this study. Eligible participants were invited to participate in an in-person session (Part 1) and EMA protocol (Part 2). All research procedures in this study were approved by Temple University's Institutional Review Board. For additional design details, see Burke et al. (2021).

Part 1. At the in-person session, participants completed a written consent form and baseline assessments, including diagnostic interviews and an interview to confirm repetitive NSSI history.

Part 2. Participants were instructed on the EMA procedures and completed a sample EMA survey during the in-person session to ensure comprehension of the questions presented in each EMA alert. The definition of NSSI, as well as NSSI urges, was reviewed with each participant by study personnel during the in-person session. The day after the in-person session, participants began to receive EMA alerts, which included a link to a Qualtrics questionnaire sent via text message. Four questionnaire links were sent per day for a period of ten days (total 40 alerts per participants; 2,560 total alerts across participants). The first questionnaire at the beginning of each day was pre-programmed to be received by the participant at their typical wake-time and assessed sleep indices; these data were not analyzed in the current study. The other three signal contingent questionnaires were identical and randomized to be received by participants during a morning, afternoon, and an evening block across a 12 h window of their choosing (e.g., 10am–10pm). Participants were asked to respond to the survey immediately after receiving the alert. Participants received course credit for completing the EMA study protocol. To increase adherence to the EMA protocol, participants were offered an additional incentive of one course credit or $15 for the completion of at least 85% of the EMA surveys. In order to receive credit toward this additional incentive, participants were asked to complete each signal contingent survey within 30 minutes of receiving the alert. Each signal contingent questionnaire asked participants to report on a range of current and recent experiences, emotions, and behaviors, and took approximately 2.8 min to complete. The current analysis employed the EMA questions assessing the BAS subscales of drive, reward responsivity, and fun-seeking, as well as NSSI urge severity.

2.3. Measures

2.3.1. Screener

The Deliberate Self Harm Inventory (DSHI; Gratz, 2001) assesses engagement in 17 methods of NSSI behaviors (e.g., cutting, burning) across the lifetime. For each type of self-injurious behavior endorsed, participants were asked to indicate the frequency with which they have engaged in each behavior over the lifetime and the past year. In the current study, the DSHI was modified to add the clause, "without intending to kill yourself" to the end of each prompt to ensure the self-injurious behavior was enacted without lethal intent. Prior research has supported the DSHI's psychometric reliability and validity, including its test-retest reliability, and construct, discriminant, and convergent validity in a university student sample (Fliege et al., 2006; Gratz, 2001).

2.3.2. Part 1: In-person assessment

Lifetime History of NSSI. The Self-Injurious Thoughts and Behaviors Interview (SITBI; Nock, Holmberg, Photos, and Michel, 2007) is a semi-structured interview that assesses key components of self-injurious thoughts and behaviors, including their presence and frequency. In the current analysis, only the subsections of the SITBI assessing NSSI thoughts and behaviors were utilized. In conjunction with DSHI screener responses, the SITBI was used to confirm that participants met criteria for inclusion into one of the two groups. Research has supported strong inter-rater reliability, construct validity, and test–retest reliability of the SITBI (Nock et al., 2007).

2.3.3. Part 2: Ecological momentary assessment

NSSI Urge. The intensity of momentary urges to engage in NSSI were assessed with the question, "Right now, how intense is your urge to engage in non-suicidal self-injury?" Participants were asked to rate this item three times per day on a Likert scale from 0 (*not at all*) to 9 (*very much*). An NSSI urge was calculated as present for a given alert in this study if a participant rated the urge intensity as 1 or higher. The continuous measure of momentary NSSI urge intensity was analyzed as the dependent variable.

Behavioral Approach System Sensitivity. In the current study, three items were adapted from the BAS Drive, Reward Responsiveness, and Fun-Seeking subscales, respectively, of the BIS/BAS (Carver and White, 1994) and included in the EMA signal contingent surveys to examine momentary reward sensitivity. One item assessed BAS Drive: "Right now, I would go all out to get something if I wanted it." A second item assessed BAS Reward Responsiveness: "Right now, if a good thing were to happen to me it would affect me strongly" and a third item assessed BAS Fun Seeking: "Right now, I would try anything new if I thought it would be fun." Items were rated on a Likert scale from 0 (*not at all*) to 9 (*very much*) with higher scores indicating greater BAS sensitivity. Given the non-normal distribution of the items, we were unable to utilize the Random Intercept Cross-Lagged Panel Model (RI-CLPM; (Hamaker et al., 2015) in Mplus (Muthen & Muthen, 2018) to examine whether there was a latent factor describing the three BAS items at within-person and between-person levels across time.

2.3.4. Analytic strategy

Descriptive statistics and a histogram of the presence of an NSSI urge were generated. To explore whether behavioral approach items were associated with NSSI urge severity during the EMA period, given the distribution of NSSI urges was zero-inflated, several multi-level models (MLMs) were fit to the data. Zero-inflated Poisson (ZIP)[1] provided the best model fit among zero-inflated Poisson, Poisson, zero-inflated negative binomial, and negative binomial distributions, by yielding the lowest Widely Applicable Information Criterion (WAIC; Watanabe, 2010). ZIP is a two-stage modeling process: the first estimates the probability of whether or not the responses of zeros are from an individual who experienced any NSSI urge (i.e., 0 for no urge, 1 for the presence of any urge), using a Bernoulli distribution; the second estimates the degree of severity (i.e., among those with any non-zero urge, how severe is the urge) among the positive responses, using a Poisson distribution.

The WAICs were compared using the *loo* package (Vehtari et al., 2020) in the R statistical environment (R Core Team, 2020). The zero-inflated Poisson models were conducted using the *brms* R package (Bürkner P, 2018). We conducted concurrent and prospective MLMs with observations (level 1) nested within people (level 2). In the concurrent models, we examined associations between momentary ratings of BAS items and ratings of NSSI urge severity from the responses to the same prompt. In the prospective models, we examined associations between momentary ratings of BAS items at T and NSSI urge severity at T+1. In a second set of prospective models, we included NSSI urge severity at T as a predictor variable, thereby controlling for the effect of NSSI urge at T. NSSI urge severity was person centered to disaggregate within- and between-person variances. The time unit used in analyses was sequential alert number, ranging from 1–30.

In line with prior research with this analytic sample (see Burke et al., 2021), we included only those alerts that were completed within 3 h of their receipt, and that occurred at least 30 min apart from one another to allow a sufficient amount of time to lapse between alerts, and thus analyzed a total of 1876 prompts. For prospective analyses, we limited the alerts to only those that occurred within 12 h of one another (n = 1448), excluding approximately 22.8% of alerts included in the concurrent analyses. Alerts were, on average, 4.02 h apart (SD = 1.41 h).

3. Results

3.1. Descriptive statistics

We previously have reported on the descriptive statistics of NSSI urge and behaviors history and endorsement during the EMA period for the present sample (Burke et al., 2021). The mean number of lifetime acts of NSSI ranged from 2 to 720 (M = 54.34, SD = 124.8). Approximately 20.3% (n = 13) endorsed NSSI engagement and 31.7% (n = 20) endorsed experiencing NSSI urges over the past one month. Nine (14.1%) participants indicated that they engaged in NSSI during the EMA period. During the EMA period, 43.8% (n = 28) endorsed experiencing any non-zero NSSI urge; the mean number of NSSI urges was 2.36 (SD = 3.79).

The average signal contingent alert compliance rate was approximately 87.43% in the analytic sample (M = 26.23; SD = 3.35). Of the 1876 alerts included within the concurrent MLMs, participants reported non-zero NSSI urges on 8% (n = 150) and NSSI behavior on 0.8% (n = 15). Of the 1448 alerts included within the prospective MLMs, participants reported non-zero NSSI urges on 8.22% (n = 119) and NSSI behavior on 0.9% (n = 13).

Table 1
Descriptive statistics of BAS and NSSI urge for the concurrent and prospective analysis study samples.

	Concurrent analysis sample (64 participants, 1876 Prompts)		Prospective analysis sample (64 participants, 1448 Prompts)	
	M	*SD*	*M*	*SD*
Behavioral Approach System				
Drive	1.87	2.35	1.86	2.35
Reward Responsiveness	4.48	2.75	4.44	2.73
Fun Seeking	2.58	2.58	2.65	2.60
NSSI urge severity	0.26	1.08	0.27	1.08

[1] A random intercept only model was selected according to the WAIC criteria and was used for all analyses.

Table 1 shows the descriptive statistics of drive, reward responsivity, and fun seeking, and NSSI urge level item endorsement.

3.2. Does reward sensitivity predict concurrent and prospective NSSI urge intensity?

Drive. In the concurrent model, drive was positively associated with NSSI urge severity in the count portion ($B = 0.10$, $EE = 0.03$, 95% Bayesian Credible Interval (BCI): 0.04, 0.17, Table 2, Fig. 1). More specifically, in the count portion, one unit increase in Drive increased the expected urge by 11% (IRR = 1.11). However, drive was not associated with the log odds of an inflated zero, or the likelihood to have a momentary NSSI urge. In the prospective model, there was no significant association between drive and NSSI urge intensity in the count portion or zero-inflation part, with or without adjusting for NSSI urge intensity at T1.

Reward Responsiveness. In the concurrent model, reward responsiveness was positively associated with NSSI urge severity in the count portion ($B = 0.08$, EE = 0.04, 95% BCI: 0.01, 0.15, Table 2, Fig. 1). In the count portion, one unit increase in reward responsiveness increased the expected urge by 8% (IRR = 1.08). However, reward responsiveness was not associated with the log odds of an inflated zero, or the likelihood to have a momentary NSSI urge. In the prospective model, there was no significant association between Reward Responsiveness and NSSI urge intensity in the count portion or zero-inflation portion, with or without adjusting for NSSI urge intensity at T1.

Fun Seeking. In the concurrent model, fun seeking was not associated with NSSI urge severity in either the count portion, nor the log odds of an inflated zero. In the prospective model, there was no significant association between fun seeking and NSSI urge severity in the count portion or zero-inflation portion, with or without adjusting for NSSI urge intensity at T1 (Table 2, Fig. 1).

Table 2
Association between BAS subscales and NSSI urges using zero-inflated Poisson models.

	Count portion			Zero-Inflated model		
Predictors	B (log)	Est. Error	95% Credible Interval	B (logit)	Est. Error	95% Credible Interval
Concurrent Models						
Drive	0.10	0.03	**[0.04, 0.17]**	-0.12	0.07	[-0.26, 0.02]
Reward Responsiveness	0.08	0.04	**[0.01, 0.15]**	0.00	0.06	[-0.15, 0.11]
Fun Seeking	0.01	0.04	[-0.06, 0.08]	0.07	0.08	[-0.11, 0.12]
Prospective Models						
Drive	0.05	0.04	[-0.03, 0.12]	-0.10	0.07	[-0.25, 0.04]
Reward Responsiveness	-0.01	0.03	[-0.07, 0.05]	-0.00	0.06	[-0.13, 0.12]
Fun Seeking	0.01	0.04	[-0.06, 0.08]	0.07	0.08	[-0.09, 0.22]
Prospective Model Adjusting for NSSI Urges at T1						
Drive	0.02	0.05	[-0.08, 0.10]	-0.12	0.09	[-0.27, 0.03]
Reward Responsiveness	-0.04	0.04	[-0.11, 0.03]	-0.02	0.07	[-0.12, 0.11]
Fun Seeking	0.06	0.07	[-0.07, 0.19]	0.12	0.09	[-0.04, 0.30]

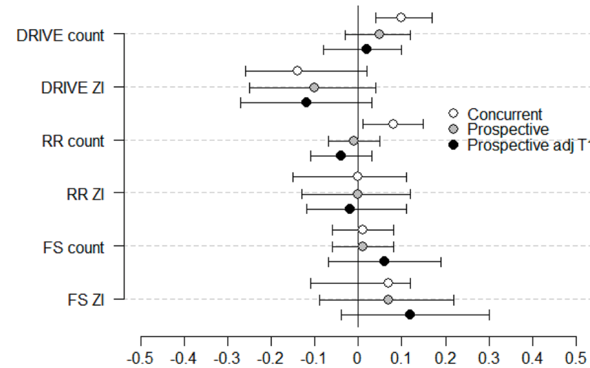

Fig. 1. Association between BAS subscales and NSSI urges using zero-inflated Poisson models.

4. Discussion

The current study aimed to provide a more nuanced examination of the relationship between the urge to engage in NSSI and three key facets of BAS at the momentary level and within individuals. Hypotheses were partially supported. Findings demonstrated differential relationships with each facet of BAS when examined concurrently with NSSI urges; however, no associations between BAS facets and prospective NSSI urges were found.

The BAS facet of drive, which is conceptualized as how persistent one is in pursuing desired goals (Carver and White, 1994), was positively associated with the concurrent experience of NSSI urges within individuals. This finding was observed only in the count portion of the concurrent model, suggesting that greater drive may be associated with urge severity among those experiencing NSSI urges. Drive demonstrated the strongest positive relationship with concurrent NSSI urges compared to the other BAS facets. Prior research using a between-persons design found no association between drive and retrospectively measured NSSI behavior frequency (Cerutti et al., 2012). A limited literature has focused on the examination of NSSI urges, with no studies to our knowledge investigating the concurrent and prospective *real-time* and *within-person* relationships between ecologically valid assessments of BAS and NSSI urges. It is possible that drive may be more strongly related to NSSI urges than behavior, and specifically, may be more strongly related on a momentary basis, and primarily within a within-person context. Although NSSI urges predict subsequent NSSI behavior (Ammerman et al., 2017b), not every NSSI urge results in an NSSI act. An interesting and important avenue for future research to consider is whether drive is predictive of the transition from NSSI urge to engagement in NSSI behavior.

Reward responsiveness also was found to be concurrently and positively associated with NSSI urge within the count portion of the model, suggesting that it may be associated with greater NSSI urge severity within individuals. Overall, this finding is in line with a fairly robust literature demonstrating a positive association between reward sensitivity and NSSI (e.g., Burke et al., 2015; Cerutti et al., 2012; Robertson et al., 2013) and extends these findings to NSSI urges. As reward responsiveness reflects the degree to which one experiences positive responses to rewards (Carver and White, 1994), our finding supports several theoretical models of NSSI. Indeed, NSSI may be maintained through positive and / or negative reinforcement (Hepp et al., 2020; Nock and Prinstein, 2004), both of which may represent a rewarding experience (i.e., feeling generation, reduction of negative affect). Given the present sample had a repeated NSSI history, it is then possible that reward responsiveness (based in part on conditioned reward derived from prior NSSI behavior) may be driving NSSI urges. An interesting avenue of future research may be to consider the role of NSSI's perceived effectiveness in this relationship (Brausch and Muehlenkamp, 2018) as individuals who perceive NSSI as being more effective (i.e., rewarding) may exhibit stronger within-person associations between reward responsiveness and NSSI urges.

Only one BAS facet, fun seeking, was not associated with NSSI urges. Fun seeking measures how much one desires new rewards and seeks out reward on the spur of the moment (Carver and White, 1994). We postulate two reasons for this lack of relationship. First, it may be that fun seeking is not significantly associated with NSSI urges for all individuals who engage in NSSI, but rather may be pertinent for only a subset. For example, sensation seeking (a function of NSSI conceptualized as falling under the umbrella of positive reinforcement) is an endorsed, albeit not commonly endorsed (e.g., Guérin-Marion et al., 2018), function of NSSI (Klonsky and Glenn, 2009); it is possible that fun seeking is closely linked to the sensation seeking function of the behavior, and thus, relevant for only a subset of those with a NSSI history. An alternative explanation is that fun seeking may be related to specific NSSI characteristics, rather than the severity of NSSI urges. Prior work has demonstrated a positive relationship between a specific facet of impulsivity, positive urgency – defined as acting rash in the face of positive emotion – and the latency between NSSI urge onset and NSSI behavior (Peckham et al., 2020). As both fun seeking and positive urgency tap into rash or spur of the moment behavior, we might anticipate a similar relationship with NSSI latency, rather than the presence or severity of NSSI urges. This speculation will be necessary to examine in future research.

None of the BAS subscales prospectively predicted NSSI urge presence or severity. Although it was hypothesized that such prospective relationships would be present, there has been limited research on NSSI urges in an EMA context for comparison. In a recent review of daily studies examining NSSI, only 14 studies have examined NSSI urges, and the large majority of these focus on the experience of negative emotion in relation to subsequent NSSI urges (Hepp et al., 2020). It is possible that our study design, with an average of four hours between each alert, may have precluded us from detecting existing prospective relationships. Indeed, the momentary, or state-like experience of BAS drive or reward responsiveness may only be associated with an individual's experience of NSSI urges in the moment (e.g., within the EMA alert window), or immediately thereafter (e.g., within minutes or 1–2 h). Future research should investigate whether prospective associations emerge in a study designed to capture shorter-term changes than afforded in the present study. However, it is also possible that the lack of prospective prediction in the present study simply suggests that these cognitive states are associated only on a momentary basis with NSSI urges and may not confer risk.

4.1. Limitations

The present study has a number of strengths, including its employment of ecologically valid assessment methods with relatively high adherence rates, and its use of a sample with a prior history of repetitive NSSI. However, there are several limitations worth acknowledging. First, this study was limited by its use of single items to assess the BAS-constructs of drive, reward responsiveness, and fun seeking. Although a strength of this study was our ability to assess all three constructs within the confines of an EMA protocol that requires very brief surveys to support adherence, the use of single items prevents us from assessing the psychometric properties of these items. Future studies should aim to develop psychometrically sound brief measures of these BAS constructs and to examine whether the present findings are replicated using such measures. Second, participants had significant variability in the severity and recency of their history of NSSI, and thus, it is unclear the extent to which the present findings would replicate among a more homogenous clinically severe sample. It is important to note, however, that we did observe that almost half of the sample experienced an NSSI urge over the EMA period and this variability permitted the analysis of NSSI urge severity. Third, there exists some, yet limited, guidance on choosing the superior fitting model when evaluating non-normal data in EMA designs. Although we chose to present the zero-inflated Poisson model given evidence that it performed better than the other models, we note limited evidence in this area. Fourth, the present study focused only on within-person associations between BAS components and NSSI urges. As prior literature focused only on between-person associations, it is difficult to compare findings to extant literature. Future research may consider utilizing a measurement-burst design which permits the evaluation of both within-person and between-person associations; such a design may foster the comparison of findings in a more valid manner.

4.2. Clinical implications

The current study has several important clinical implications. Our concurrent model findings indicate that feeling strongly impacted by rewards and having a strong sense of follow-through toward goals may represent cognitive risk states that are associated with increased NSSI risk. Findings also suggest that clinicians may consider assessing for levels of goal striving motivation and sensitivity to rewards (including if engaging in NSSI is viewed as rewarding) when evaluating risk of self-injury in young adults. Our findings contribute to a foundation of work identifying temporally relevant cognitive risk states for NSSI as a means to develop just-in-time interventions to protect against risk for NSSI. However, the present findings and implications should be considered preliminary and be further investigated in more diverse non-undergraduate samples.

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Contributors

Taylor A. Burke contributed to the study design, data collection, analyses, and manuscript preparation. Sijing Shao contributed to the study design, analyses and manuscript preparation. Ross Jacobucci contributed to the study design, analyses and manuscript preparation. Marin Kautz contributed to the data collection and manuscript preparation. Lauren Alloy contributed to manuscript preparation. Brooke Ammerman contributed to the study design and manuscript preparation.

Declaration of Competing Interest

None.

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