

KU LEUVEN

FACULTY OF PSYCHOLOGY AND
EDUCATIONAL SCIENCES

**IDIOGRAPHIC MODELING OF NON-SUICIDAL
SELF-INJURIOUS URGES: A CASE DESCRIPTION
OF THREE PATIENTS IN CLINICAL CARE**

Master's thesis submitted for the
degree of Master of Science in
Master of Psychology: Theory and
Research by
Elise Van Laere

Supervisor: Dr. Glenn Kiekens
Co-supervisor: Prof. Dr. Laurence Claes
Co-supervisor: Prof. Dr. Inez Myin-Germeys

2022

KU LEUVEN

FACULTY OF PSYCHOLOGY AND
EDUCATIONAL SCIENCES

**IDIOGRAPHIC MODELING OF NON-SUICIDAL
SELF-INJURIOUS URGES: A CASE DESCRIPTION
OF THREE PATIENTS IN CLINICAL CARE**

Master's thesis submitted for the
degree of Master of Science in
Master of Psychology: Theory and
Research by
Elise Van Laere

Supervisor: Dr. Glenn Kiekens
Co-supervisor: Prof. Dr. Laurence Claes
Co-supervisor: Prof. Dr. Inez Myin-Germeys

2022

Summary

Non-suicidal self-injury is a highly prevalent yet poorly understood phenomenon among youth. To improve conceptualization, risk assessment and treatment of NSSI, it is crucial to gain a better understanding of the risk factors of NSSI. To date, most studies have investigated *who* is developmentally at greater risk to begin self-injury, with studies clarifying *when* individuals with a history of NSSI are at high risk for engaging in NSSI in the short-term being relatively scarce. Due to this scarcity of within-person research, most theories in psychopathology are grounded in nomothetic principles (i.e., investigating principles that are true for all individuals), which often causes the clinician to fit the person to the model. As this resulted in suboptimal treatment responses, researchers have made strong calls to acknowledge each individual's unique experience, highlighting the importance of an idiographic approach in investigating within-person processes leading up to NSSI. Fortunately, due to the recent advances in technology and statistical analyses, Experience Sampling Methodology (ESM) now enables researchers to gain insight into patients' daily life by the ability to assess thoughts, emotions, and behaviors multiple times a day with the use of mobile devices.

Addressing these research gaps, the current ESM study examined the momentary (i.e., correlates) and temporal associations (i.e., short-term risk factors) between the affective (i.e., negative affect) and cognitive (i.e., rumination and self-criticism) states, as well as their interaction, with NSSI urges. Data from three young patients who self-injure were used to illustrate these associations. Single-level autoregressive models were conducted within the Dynamic Structural Equation Modeling Framework (DSEM) to model the data gained from the highly intensive longitudinal design. Three main findings were obtained in our study. First, demonstrating the individual's unique experience, not every short-term predictor was equally meaningful for each patient. Second, momentary associations between the affective and cognitive states with NSSI were more potent than the temporal associations. Lastly, only the strength of NSSI urges at the previous time point predicted NSSI urge intensity consistently at a later point in time. The findings of this dissertation substantiate the recent calls for more personalized models and interventions in psychopathology.

Although these initial findings need to be replicated, investigating within-person processes leading up to NSSI (urges) from an idiographic approach multiple times a day could be optimal building blocks for bottom-up, real-time models of NSSI, that allow elucidating meaningful targets for person-tailored interventions.

Acknowledgements

During my master's degree in clinical psychology, I got fascinated and interested in research that substantiates clinical practice. Therefore, I started the master theory and research with the aim to increase my researcher skills to ultimately be able to contribute to evidence-based support for clinical practice. As non-suicidal self-injury is highly prevalent yet still poorly understood, I am grateful to deepen my knowledge about this topic and to be able to contribute to an increased understanding of NSSI in daily life.

Although I enjoyed working on this thesis, there were a lot of challenging moments. This brings me to thanking and expressing my gratitude to everyone who helped me throughout this process and in realizing this thesis.

First, I would like to thank my supervisory team for the opportunity to work on this interesting, clinically relevant topic. I wish to thank Prof. Dr. Germeys and Prof. Dr. Claes for sharing their expertise on this topic as well as for their encouraging feedback. Next, I would like to especially thank Dr. Kiekens for his supportive guidance during the past two years. I am grateful Dr. Kiekens supported and challenged me in working as independent as I could, while also being available to help me when I had questions. His expertise and insight in conducting research on NSSI was inspiring and motivating, and greatly contributed to my development as a researcher.

Furthermore, I would like to thank my family for giving me the opportunity to pursue my interests and supporting me throughout this challenging period. Next, I want to thank my friends for the joyful moments and their support. I also want to thank Emiel for his positive mindset and encouraging words throughout this process.

Finally, I want to especially thank the participants that took part in this research.

Approach and Contribution to the Thesis

In the first voting round, I got assigned to the proposal of idiographic modeling of non-suicidal self-injurious thoughts and behaviors. Shortly after, Dr. Kiekens and I set up a meeting in which Dr. Kiekens gave information about the topic and the research gaps and we discussed the expectations of the first year. He also provided relevant literature to get started with the literature review. After I got familiarized with the literature, we outlined the structure for the introduction, on which I started writing. During the second semester, the scope of the study was narrowed down. In discussion with Dr. Kiekens, I decided on the variables we would focus on in our research and formulated two research questions concerning the thesis topic. At the end of this phase, I presented the scope (i.e., brief background information and the research gaps leading up to the research questions and a short description of the method section) of the study for the Center of Contextual Psychiatry research unit. As a student, I could not participate in the data collection (patient population). Instead, I wrote Rcode to visualize the data presented to the patients by their clinician after they completed the 28-day ESM protocol. During the summer, I finished the introduction and worked on the method section as the first patients then completed the entire protocol.

During the first semester of the second year, I learned how to work with Mplus and how to write the models of interest correctly. Furthermore, I prepared the data, analyzed the data, and wrote Rcode for visualization of our data included in the result section. During the second semester, I finished writing down the results. Next, the findings were interpreted with help from Dr. Kiekens. Lastly, I wrote the limitations, clinical implications, conclusion, and summary.

Throughout the process, Dr. Kiekens helped me with determining a clear structure to be able to present a well-formulated and clear thesis. Additionally, he frequently provided intext feedback through which I could learn and improve my English writing. He also frequently suggested literature to read, which helped me capture the broader context and relevance of this thesis. Prof. Claes and Prof. Germeys provided general feedback on the content and structure of the thesis. Their expertise helped me to improve the quality of this work.

Table of Contents

Summary	i
Acknowledgements.....	ii
Approach and Contribution to the Thesis	iii
Table of Contents	iv
List of Tables.....	vi
List of Figures	vi
1. Introduction	1
1.1 Definition of Non-Suicidal Self-Injury.....	1
1.2. Prevalence of NSSI and NSSI Disorder	1
1.3 Why Do People Self-Injure?.....	2
1.4 Should we Care About NSSI?	3
1.5. Risk Factors of NSSI.....	5
1.5.1. Long-Term Predictors of NSSI.....	5
1.5.2. Theoretical Risk Models of NSSI.....	6
1.5.3. Negative affect, Rumination, and Self-Criticism in the Course of NSSI	7
1.5.4. Limitations of a Nomothetic Approach	9
1.5.5. Short-Term Risk Predictors of NSSI, NSSI Thoughts, and NSSI Urges.....	10
1.6. Importance of an Idiographic Approach in Studying NSSI Urges.....	13
1.7. The Current Study	15
1.7.1. Research Question 1: Contemporaneous Associations Between Negative Affect, Rumination, and Self-Criticism With NSSI Urge Intensity.....	15
1.7.2. Research Question 2: Temporal Associations Between Negative Affect, Rumination, and Self-Criticism With NSSI Urge Intensity	16
2. Methods	18
2.1. Patients and Procedure.....	18
2.2. Baseline Measures	19
2.3. Ecological Momentary Assessment.....	19

2.4. Statistical Analyses.....	20
3. Results	22
3.1. Case Descriptions	22
3.2. Descriptive Results	22
3.3. Research Question 1: Contemporaneous Associations Between Negative Affect, Rumination, and Self-Criticism With NSSI Urges.....	24
3.4. Research Question 2: Temporal Associations Between Negative Affect, Rumination, and Self-Criticism With NSSI Urges.....	27
4. Discussion.....	31
4.1. Limitations and Future Research Directions	34
4.2. Clinical Implications.....	36
4.3. Conclusion.....	38
5. References	39

List of Tables

Table 1. Four-Factor Model (Nock & Prinstein, 2004)	3
Table 2. Means and Standard Deviations of Affective and Cognitive Variables.....	23
Table 3. Contemporaneous Associations Between Negative Affect, Rumination, and Self-Criticism With NSSI Urges.....	24
Table 4. Contemporaneous Associations Between Negative Affect, Rumination, Their Interaction and NSSI Urges.....	25
Table 5. Contemporaneous Associations Between Negative Affect, Self-Criticism, Their Interaction and NSSI Urges.....	26
Table 6. Temporal Associations Between Negative Affect and NSSI Urges	27
Table 7. Temporal Associations Between Rumination and NSSI Urges	28
Table 8. Temporal Associations Between Self-Criticism and NSSI Urges.....	29
Table 9. Temporal Associations Between Negative Affect, Rumination, Their Interaction and NSSI Urges.....	30
Table 10. Temporal Associations Between Negative Affect, Self-Criticism, Their Interaction and NSSI Urges	30

List of Figures

Figure 1. Graphical Illustration of First Research Objective	16
Figure 2. Graphical Illustration of Second Research Objective	17
Figure 3. Trajectories of NSSI Urge Intensity, Negative Affect, Rumination, and Self-Criticism	23
Figure 4. The Synergistic Interaction Effect Between Negative Affect and Rumination on NSSI Urge Intensity for Patient One.....	25
Figure 5. The Synergistic Interaction Effect Between Negative Affect and Self-Criticism on NSSI Urge Intensity for Patient One.....	26

1. Introduction

1.1 Definition of Non-Suicidal Self-Injury

Non-suicidal self-injury (NSSI) is a growing public health problem among young people worldwide (Cipriano et al., 2017). NSSI is defined ‘*as the deliberate, self-inflicted damage of one’s own body tissue without suicidal intent and for purposes not socially or culturally sanctioned*’ (International Society for the Study of Self-injury, 2018). This definition highlights several essential aspects for a behavior to be defined as NSSI. First, the injury must be inflicted deliberately, which means that actions that cause unintentional harm (e.g., accidents) do not classify as NSSI. Second, NSSI is defined by immediate physical injury, which implies that behaviors that cause physical injury in the long run, such as food restriction or substance abuse, are excluded. Third, behaviors with at least some intent to kill oneself are, as the term indicates, not considered NSSI but defined as a suicide attempt. Finally, physical damage acceptable in society or part of a recognized cultural, spiritual, or religious ritual is also not considered NSSI (International Society for the Study of Self-injury, 2018). Typical forms of NSSI include cutting oneself, head banging, scratching, hitting, and burning oneself (Klonsky & Muehlenkamp, 2007; Whitlock et al., 2006). Most people who engage in NSSI report using more than one method (Cipriano et al., 2017; Turner et al., 2013), with an increasing number of NSSI methods predicting elevated levels of psychopathology (Anestis et al., 2015; Nock et al., 2006; St. Germain & Hooley, 2012).

1.2. Prevalence of NSSI and NSSI Disorder

Engaging in NSSI¹ is not restricted to a specific age, gender, ethnicity, or social class. However, research has shown that NSSI is most common in adolescents and emerging adults, with about 17-18% of young people in non-clinical samples reporting NSSI at least once in their lifetime (Muehlenkamp et al., 2012; Swannell et al., 2014). The average age of onset of NSSI is between 14 and 16 years, with a decline in prevalence in late adolescence (Plener et al., 2015). However, recent work has indicated a second smaller onset peak at the beginning of emerging adulthood, around 20 years (Gandhi et al., 2018). Importantly, evidence suggests that an earlier onset of NSSI is associated with more severe self-injurious behavior (Ammerman et al., 2018; Kiekens et al., 2018). While NSSI is often episodic among adolescents (Plener et al., 2009), the 12-month incidence remains 2-14% in emerging adults (Benjet et al., 2017; Kiekens et al., 2018; Plener et al., 2015). Among adults, the lifetime

¹ NSSI when used in this thesis refers to NSSI behavior unless otherwise specified (e.g., NSSI thoughts, NSSI urges).

prevalence of NSSI is estimated at around 5.5% (Swannell et al., 2014). Among individuals struggling with mental health problems (especially depression and anxiety), NSSI is more common compared to healthy controls (Fox et al., 2015; Nock et al., 2006; Taliaferro & Muehlenkamp, 2015). Bresin and Schoenleber (2015) found in a recent meta-analysis that women tend to engage slightly more in NSSI than men, especially in clinical samples. In addition, these researchers found gender differences concerning the methods used to harm oneself. Women are more likely to use cutting and scratching, whereas men report more head-banging or burning themselves (Bresin & Schoenleber, 2015; Claes et al., 2007; Whitlock et al., 2011).

There is debate among researchers and clinicians about whether NSSI should be conceptualized as a disorder (Zetterqvist, 2015). Historically, NSSI was primarily seen as a symptom of the borderline personality disorder. Yet, research revealed that NSSI is not pathogenic of one particular disorder (Nock et al., 2006; Selby et al., 2015). In 2013, the fifth edition of the Diagnostic and Statistical Manual of Mental Disorders, Section III included the NSSI disorder (NSSI-D) as a condition ‘requiring further study’.

1.3 Why Do People Self-Injure?

Importantly, classifying NSSI as a disorder does not explain why someone engages in self-injury. Therefore, researchers have also investigated the functions of self-injury. The Four-Factor Model (FFM; Nock, 2009; Nock & Prinstein, 2004) is one of the most widely adopted functional models of NSSI. The FFM suggests that people engage in NSSI due to four reinforcement processes, based on the crossing of two dimensions: an interpersonal (other) versus intrapersonal (self) dimension, and a negative versus positive reinforcement dimension (Table 1). The intrapersonal functions of NSSI aim to change the emotional or cognitive state of the person itself. The *intrapersonal negative reinforcement* function includes NSSI to decrease or distract the individual from aversive thoughts and feelings that arise (e.g., to stop bad feelings). The *intrapersonal positive reinforcement* function explains NSSI as an engagement that could generate desired feelings or stimulation (e.g., experiencing a sense of euphoria or thrill). In contrast, the interpersonal functions of NSSI are focused on their relationship with others and on influencing others' behavior. While *interpersonal negative reinforcement* involves engagement in NSSI to escape from undesired social situations (e.g., avoid being confronted for a mistake), *interpersonal positive reinforcement* maintains NSSI by influencing the social environment (e.g., getting support).

Table 1

Four-Factor Model (Nock & Prinstein, 2004)

Reinforcement type	Positive	Negative
Interpersonal	Gaining attention or support from others	Avoiding responsibilities, consequences, or interpersonal task demands
Intrapersonal	Inducing a desirable physiological state	Reducing tension or other negative affective states

Note. Adapted from ‘Functional Approach to the Assessment of Self-Mutilative Behavior’ by M. K. Nock and M. J. Prinstein, 2004, *Journal of Consulting and Clinical Psychology*, 72(5), 885–890, (<https://doi.org/10.1037/0022-006X.72.5.885>). Copyright 2004 by the American Psychological Association.

A decade of research revealed that emotion-regulation (i.e., reducing negative affect and inducing positive affect) is the most commonly (66-81%) reported function of NSSI (Cipriano et al., 2017; Taylor et al., 2018). Furthermore, wanting to punish oneself and communication of distress were also frequently reported functions across studies, respectively 51% and 42%. Interestingly, lower prevalence rates were found for interpersonal functions of NSSI, such as influencing others and punishing others (27-43%), refuting the common conception that NSSI is mainly about seeking attention and manipulating others (Caicedo & Whitlock, 2009).

1.4 Should we Care About NSSI?

Research indicates that engagement in NSSI predicts a wide range of mental health problems and other adverse outcomes for the individual and their close context later in life (Daukantaitė et al., 2020; Kiekens et al., 2016; Waals et al., 2018). More specifically, longitudinal research suggests that adolescents who report NSSI experience lower life satisfaction, shame and embarrassment about scars, stigmatization and are more likely to report a range of psychopathological symptoms, such as depression, substance abuse, anxiety, and are at higher risk for a future suicide attempt (Burke et al., 2019; Daukantaitė et al., 2020; Wilkinson et al., 2018). Some studies also find negative effects on the mental health of loved ones (Waals et al., 2018).

Perhaps most importantly, research indicates that NSSI increases the risk of developing suicidal thoughts, making suicidal plans, and acting on those plans by attempting suicide (Kiekens et al., 2018). According to the Interpersonal Theory of Suicide (Van Orden et al., 2010), individuals need to acquire the capability of ending one's life to be able to act upon a suicidal desire and attempt suicide. By repeatedly engaging in NSSI, this theory postulates that people build the capability to attempt suicidal behavior (Willoughby et al., 2015) as they become desensitized to the fear and pain associated with more lethal self-injury over time (Joiner et al., 2012)

Furthermore, Robinson and colleagues (2019) found that adolescents who report NSSI show prospectively reduced emotion-regulation skills. According to the authors, engagement in NSSI may prevent adolescents from developing alternative, more adaptive emotion-regulation strategies. Developing these adaptive emotion-regulation strategies is important during adolescence, as impactful bodily and cognitive changes mark this period (Schäfer et al., 2017). In addition, making the transition from high school to college may be experienced as a stressful period (Arnett, 2000). As individuals who self-injure are more prone to experiencing stress (Kiekens et al., 2015), not developing adaptive emotion-regulation strategies could have additional adverse consequences, such as anxiety and depressive symptoms, reduced academic performance, rejection from peers, and externalizing symptomatology (Kiekens et al., 2016; Kim & Cicchetti, 2010; Kovacs et al., 2008).

Bidirectional effects have also been established between engagement in NSSI and identity formation (Gandhi et al., 2017). During adolescence, young people encounter a normative identity crisis, which represents a transition from one's childhood identity to a new identity that must be developed (Erikson, 1968). A successful resolution of this crisis (confusion vs. synthesis) leads to identity synthesis (i.e., self-identified ideas and values, temporal-spatial continuity; Côté & Levine, 1988). However, if this crisis persists, identity confusion arises with individuals experiencing inner emptiness and having no guiding life goals, which is related to several mental health problems (Schwartz, 2001; Schwartz et al., 2015). On the one hand, identity synthesis reduces one's vulnerability to engage in NSSI, while identity confusion increases this vulnerability (Claes et al., 2014, 2015). However, Gandhi et al. (2017) found that engagement in NSSI can also lead to further identity disturbances, which is characterized by a decrease in identity synthesis and an increase in identity confusion. These bidirectional effects can result in a vicious cycle where people identify with the label of being a self-injurer which may, in turn, further increase identity

confusion in the long term, as it distracts from the task of exploring and committing to life-defining choices (Gandhi et al., 2017).

Taken together, all these findings indicate the potential negative developmental impact of NSSI engagement, emphasizing the need for investigating and obtaining a good understanding of its risk factors in adolescents and emerging adults.

1.5. Risk Factors of NSSI

As NSSI frequently occurs and may further negatively impact individuals' functioning and their broader context, it is crucial to identify risk factors. In this way, we can advance the conceptualization, risk stratification, prediction, and treatment of NSSI (Fox et al., 2015; Fox, et al., 2020). In what follows, we will first consider longer-term (developmental) predictors of NSSI, which indicate *who* is at greater risk for developing NSSI. Second, we will consider two main theoretical models which explain why some individuals are at greater risk for engagement in NSSI. Third, we will review the role of negative affect, rumination, and self-criticism in the course of NSSI. Finally, we will discuss limitations of investigating only longer-term predictors of NSSI.

1.5.1. Long-Term Predictors of NSSI

To date, most longitudinal studies focused on elucidating population-level predictors that contribute to the detection of individuals *who* are at greater risk for developing NSSI throughout adolescence and emerging adulthood. Taking stock of these developmental studies, it becomes clear that a broad range of intrapersonal and interpersonal factors are related to the onset of NSSI (Kiekens et al., 2019). Concerning intrapersonal factors, researchers have found that experiencing depressive symptoms, lower positive and higher negative affective states, hopelessness, emotion-regulation difficulties, and presence of cluster B personality disorders are important precursors of NSSI (Fox et al., 2015; Plener et al., 2015; Turner et al., 2018; Valencia-Agudo et al., 2018). In addition, Hoff and Muehlenkamp (2009) found that college students who engage in NSSI behavior reported significantly higher levels of rumination. Furthermore, Burke and colleagues (2020) succeeded in differentiating individuals with and without a history of NSSI based on the amount of self-critical and self-punishment cognitions. In addition, both higher trait negative affect and lower trait positive affect are associated with the risk of lifetime and future NSSI (Burke et al., 2018; Nicolai et al., 2016). Regarding interpersonal factors, researchers have found that low parental support and maltreatment (like physical or sexual abuse as well as early trauma) increase the likelihood of engaging in NSSI (Kiekens et al., 2019; Tatnell et al., 2014, 2017). In terms of peer relationships, low peer support and a history of peer bullying or dating violence and

abuse also increases the susceptibility of NSSI (Esposito et al., 2019; Kiekens et al., 2019; Victor, et al., 2019).

1.5.2. Theoretical Risk Models of NSSI

Several theoretical models have been proposed to explain why some individuals are more at risk than others to engage in NSSI. The *emotional cascade model* (Selby et al., 2013) suggests that individuals with high negative affect and rumination levels are at increased risk of NSSI. Rumination is considered a transdiagnostic cognitive process consisting of repetitive attempts to analyze problems and feelings of distress without taking the necessary action to make positive changes (Nolen-Hoeksema & Morrow, 1991). According to this model, a positive feedback loop between negative affect and rumination leads to pernicious emotional cascades following a stress-inducing event. This vicious cycle between heightened negative affect and rumination will ultimately result in a highly aversive state, which is then resolved by engaging in emotion dysregulated behaviors such as NSSI. Hence, this model proposes that individuals engage in NSSI to be distracted from such an aversive emotional state by redirecting attention to intense physical sensations. A limitation of the emotional cascade model is that it does not explain why a person engages specifically in NSSI instead of other dysregulated behaviors that may serve similar functions (e.g., eating disordered behaviors, substance abuse).

Addressing this limitation, the *benefits and barriers model of NSSI* (Hooley & Franklin, 2018) states that most people have instinctive barriers that keep them from beginning NSSI (e.g., aversion of pain, positive view of the self, social norms). The model proposes that any barrier would be sufficient to prevent individuals from engaging in NSSI. Hence, these barriers must be overcome before someone can engage in NSSI. The proposed benefits are accessible to everyone and explain why some individuals chose to engage in NSSI. A first benefit is that NSSI reduces negative affect and increases positive affect (Muehlenkamp et al., 2009; Selby & Joiner, 2009). A second benefit of NSSI is the gratification of self-punishment desires, which helps explain why self-critical individuals may regard NSSI as a self-congruent method (Hamza et al., 2014; Hooley et al., 2010). A third benefit states that NSSI provides peer group affiliation, which suggests that individuals may self-injure because the members of the preferred peer group also engage in this behavior (Claes et al., 2010). The last benefit states that NSSI can communicate distress when less intense communication forms (e.g., talking, crying) tend to be ineffective or it can signal strength to others, especially in prison populations (Gambetta, 2009).

Taken together, both theories underscore the importance of the intrapersonal variables negative affect, rumination, and self-criticism as crucial factors that underlie the course of NSSI. In what follows, we consider the relationship between negative affect, rumination, and self-criticism and NSSI in more detail.

1.5.3. Negative affect, Rumination, and Self-Criticism in the Course of NSSI

1.5.3.1. Negative Affect. As previously stated, the intrapersonal negative reinforcement function (i.e., engaging in NSSI to reduce negative affect) is the most frequently reported function of NSSI (Cipriano et al., 2017; Taylor et al., 2018). In line with this finding, laboratory-based research of Bresin and Gordon (2013) indicates greater reductions in negative affect following the application of a painful stimulus for individuals with a history of NSSI. Cross-sectional studies also demonstrate that a history of NSSI is associated with higher levels of negative affect. More specifically, these studies found that individuals who self-injure often experience higher levels of negative affect than peers without a history of NSSI (Klonsky & Muehlenkamp, 2007; Victor & Klonsky, 2014). Furthermore, as summarized in the recent meta-analysis of Fox et al. (2015), negative affect (conceptualized as affect dysregulation) was a significant predictor of future NSSI.

1.5.3.2. Rumination. Extant literature indicates rumination to correlate with the presence of NSSI in adolescent and adult samples (Selby et al., 2013; Selby & Joiner, 2009). For instance, Hoff and Muehlenkamp (2009) found that individuals who self-injure report more rumination than individuals without a history of NSSI. The experimental study of Selby and colleagues (2009) supports this finding as individuals engaging in NSSI demonstrated a stronger reaction to lab-based rumination induction than controls. Moreover, prospective studies also provided evidence that rumination predicts the onset of NSSI (Barrocas et al., 2015; Gromatsky et al., 2020).

Previous studies have demonstrated the tendency of rumination to worsen and sustain the intensity and duration of negative affect (Moberly & Watkins, 2008; Thomsen, 2006). In line with this finding and the emotional cascade model (Selby et al., 2013), most research concerning rumination and engagement in NSSI has focused on the potential synergetic influence of negative affect and rumination on engagement in NSSI. Ongoing research provides growing support for the model's validity, indicating the moderating role of rumination in strengthening the relation between negative affect and engagement in NSSI (Selby et al., 2013). More specifically, longitudinal studies using high-risk and clinical population data confirm the synergetic relationship between rumination and negative affect (Gong et al., 2019; Nicolai et al., 2016). For instance, Nicolai and colleagues (2016) found

rumination to strengthen the association between negative affect with overall NSSI engagement and NSSI frequency. Relatedly, prospective studies provide evidence for positive reciprocal associations between rumination and negative affect (Buelens et al., 2019; Jose & Weir, 2013; Thomsen, 2006). Taken together, research suggests that rumination predicts increased negative affect and negative affect predicts increased rumination. As a result of the sustained attention devoted to a negative stimulus, the negative emotion is experienced over a longer time (Thomsen, 2006), which may induce the urge to reduce this tension by engaging in NSSI (Selby et al., 2013).

1.5.3.3. Self-Criticism. Self-criticism involves harsh self-scrutiny, overly critical evaluations of one's own behavior, and negative reactions to perceived failures in terms of active self-bashing (Löv et al., 2020). It is often associated with feelings of failure, worthlessness, and inferiority and is considered a significant risk factor for engagement in NSSI among adolescents and adults (Claes et al., 2010). Put forward as a leading construct in the benefits and barriers model (Hooley & Franklin, 2018), self-criticism may decrease the threshold for engagement in NSSI, and explain the specific selection of NSSI over other maladaptive behaviors as a coping strategy. The recent meta-analysis of Zelkowitz and Cole (2019) revealed a solid cross-sectional relationship between self-criticism and NSSI. Studies investigating group differences also suggest that individuals who self-injure report a higher level of self-criticism than individuals without a history of NSSI (Claes et al., 2012; St. Germain & Hooley, 2012). Only one study to date has investigated the specific relation between negative affect and self-criticism in the prediction of NSSI. The cross-sectional study of Hasking and colleagues (2019) indicates that the lack of self-compassion underlies the relationship between negative affect and NSSI, suggesting that individuals who are likely to experience higher levels of negative affect and have self-judgmental cognitions as a response to a challenging emotional experience may be more likely to engage in NSSI.

Furthermore, experimental research demonstrates that self-critical beliefs are associated with willingness to endure pain longer (Hooley et al., 2010; Hooley & St. Germain, 2014). In the study of Fox et al. (2019), mood improvements during pain were also positively related to self-criticism among people with and even without a history of NSSI. Similarly, Hamza et al. (2014) found that individuals who report self-punishment as the primary motivation for engagement in NSSI, demonstrated increased pain tolerance and less aversive pain ratings. Results from prospective studies are, however, mixed. On the one hand, Zelkowitz and Cole (2020) and Perkins et al. (2020) demonstrated that self-criticism prospectively predicted NSSI across disordered eating behaviors. On the other hand, Daly and

Willoughby (2019) and You et al. (2017) did not find evidence that self-criticism increased the risk of NSSI. Instead, in their student sample, they found self-criticism to be a consequence of engagement in NSSI. Together, these results point to the possibility that the causal relationship between self-criticism and NSSI may go in both directions (You et al., 2017). Self-criticism may motivate NSSI, by the gratification of self-punishment desires. However, NSSI may also result in more negative feelings towards the self (e.g., shame, guilt, disgust; Laye-Gindhu & Schonert-Reichl, 2005). In sum, these results underline the importance of self-criticism on engagement in NSSI. Namely, a negatively focused attitude towards the self (e.g. self-criticism, guilt, or shame) increases the willingness to experience pain and the experienced benefits (e.g., mood regulation) of engagement in NSSI, which may make it more likely that NSSI will be maintained (Fox et al., 2019; Hooley & Franklin, 2018).

1.5.4. Limitations of a Nomothetic Approach

The discussed studies focused on clarifying *who* is at risk for engagement in self-injury throughout development. In other words, these studies provide information for risk stratification on a between-person level using a nomothetic approach. More specifically, these studies aim to explain how individuals differ from one another, to identify developmental risk factors in the entire population. Although these between-person risk factors are highly important, it is essential to realize that each person is unique and that the experience of psychopathology is an individual phenomenon. Therefore, psychopathology should also be conceptualized as an idiographic phenomenon, acknowledging the complex system of contextualized dynamic processes and mechanisms within a particular person (Voelkle et al., 2014). Taking on such an idiographic approach, in which risk stratification repeatedly occurs in daily life with individuals serving as their own control, enhances understanding of *when* individuals are at acute risk for NSSI (Kiekens et al., 2021; Wright & Woods, 2020). By investigating within-person patterns in idiographic research, personalized models can be obtained that provide insight into how NSSI manifests in daily life for different individuals (Kiekens et al., 2021).

There are several reasons why knowledge of *when* young people are at risk to engage in NSSI is still scarce. As indicated, the available longitudinal studies focus on clarifying developmental risk with often wide assessment intervals of months to years. However, these wide observation windows do not inform researchers and clinicians about the individual risk in daily life. For example, if an individual is developmentally at risk for engagement in NSSI due to, for instance, a history of sexual abuse (Tatnell et al., 2017), then this does not specify when this particular individual is most likely to self-injure in daily life (Fisher et al., 2018;

Piccirillo & Rodebaugh, 2019). Additionally, these wide observation windows require respondents to average over an extensive period (often months to years), making these responses more prone to recall biases (Stange et al., 2019). That said, researchers have historically been handcuffed by methods that rendered frequent assessments of NSSI in the daily lives of those with lived experience virtually impossible (Kiekens et al., 2021).

Fortunately, due to rapid advances in digital technology's capability and affordability over the past two decades (Malhi et al., 2017), these limitations can now be overcome (Russell & Gajos, 2020; Stange et al., 2019; Trull & Ebner-Priemer, 2013). Experience Sampling Methodology (ESM, Shiffman et al., 2008) allows for examining in-the-moment associations by assessing mood, symptoms, context, and appraisals as they occur in daily life (Myin-Germeys et al., 2018). ESM is one method that falls under the umbrella term 'ambulatory assessment' (AA) and is used interchangeably with Ecological Momentary Assessment (EMA) (Russell & Gajos, 2020). Early ESM studies have used paper-and-pencil diaries or personal digital assistants. These methods have now mainly been replaced by smartphones and tablets, prompting the participants to fill in a structured self-report diary multiple times a day (Myin-Germeys et al., 2018; Trull & Ebner-Priemer, 2013). ESM is thus a valuable technique to help clarify the proximal, real-time antecedents of NSSI and their complex interplay.

In what follows, we will discuss emerging research about the relationship between negative affect, rumination, and self-criticism and NSSI outcomes (including thoughts, urges and behavior) in daily life.

1.5.5. Short-Term Risk Predictors of NSSI, NSSI Thoughts, and NSSI Urges

A growing body of research using ESM has begun to examine the temporal events and affective states surrounding NSSI and how changes in these variables might impact the course of NSSI. Importantly, NSSI is considered a process, including NSSI thoughts, urges, and behaviors (Nock, 2009). Yet, theories of NSSI have not offered explanations for NSSI behavior that meaningfully differed from explanations for NSSI thoughts or urges. In the literature concerning suicide, ideation-to-action theories (Klonsky et al., 2018) provide a meaningful understanding of the suicidal process by obtaining evidence that suggests that risk factors of suicide ideation differ from risk factors causing the transition to an actual suicide attempt. For example, while early research suggested that depression and hopelessness are risk factors of future suicide attempts, emerging evidence indicates that these variables are predictors of suicidal ideation but fail to predict suicidal attempts when controlling for suicidal ideation (Kessler et al., 1999; Klonsky & May, 2015; May & Klonsky, 2016). Thus,

in line with these recent ideation-to-action theories, risk factors for NSSI thoughts and urges could be different from those influencing the transition to acting on those thoughts and urges with self-injurious behavior (Kiekens et al., 2020). Making this distinction is crucial to advance scientific understanding and could aid the link between research and clinical practice as this would provide insight into possibilities to prevent the transition from NSSI thoughts and urges to behavior. As longitudinal and cross-sectional studies support the involvement of negative affect, rumination, and self-criticism in the course of NSSI, several daily-life studies started to map these variables as potential short-term predictors of these NSSI outcomes.

1.5.5.1. Short-Term Risk Predictors of NSSI. Most ESM research has mapped short-term predictors for NSSI, mainly focusing on the affective rather than cognitive contexts (Rodríguez-Blanco et al., 2018). Research concerning the affective context of NSSI has predominantly focused on the momentary influence of negative affect. In line with the four-factor, intrapersonal negative reinforcement function (Nock & Prinstein, 2004), several ESM studies found elevated levels of overall negative affect before NSSI engagement (Hepp et al., 2020; Rodríguez-Blanco et al., 2018).

Studies investigating the real-time cognitive context of NSSI remain limited. Existing research found rumination was reported to interact with negative affect (Hughes et al., 2019; Zaki et al., 2013). For instance, Selby et al. (2013) found that the occurrence of frequent shifts in state rumination level of an individual (i.e., instability of rumination) was more indicative for the occurrence of an NSSI episode than their trait rumination level. Additionally, these authors found an interaction between instability in rumination levels and instability of negative affect, meaning that individuals who reported frequent shifts in rumination engaged more in NSSI when they also experienced shifts in negative affect. In addition, the results of Hughes and colleagues (2019) showed that anxiety and feeling overwhelmed predicted NSSI most strongly when rumination was elevated. As suggested by the emotional cascade model (Selby et al., 2013), these findings indicate that these factors may interact in a process creating an aversive affective state that individuals who self-injure attempt to escape by engaging in NSSI.

To date, only two studies have investigated the real-time predictive value of self-criticism on NSSI (Burke et al., 2021; Lear et al., 2019). In both studies, self-criticism did not appear to be a short-term predictor for NSSI behavior. Related to self-criticism, daily self-punishment cognitions did directly predict engagement in NSSI behavior (Lear et al., 2019). In addition, research of Nock and colleagues (2009), one of the first ESM studies concerning NSSI, found that anger or hatred toward the self predicts engagement in NSSI in real time.

Moreover, Armev and colleagues (2011) found that guilt increased in the hours preceding an episode of NSSI, peaked during the episode, and faded gradually in the hours following the episode.

Additional to these affective and cognitive short-term predictors, the presence of NSSI thoughts and urges are frequently reported to be meaningful predictors of NSSI behavior (Hepp et al., 2020). For instance, Ammerman et al. (2017) and Lear et al. (2019) found that on days with a higher number of urges and thoughts or greater urge and thought intensity, individuals were at greater risk for engagement in NSSI in that same day. Importantly, it has been demonstrated that NSSI urges and behavior often appear in close temporal proximity to one another (Ammerman et al., 2017; Fitzpatrick et al., 2020; Nock et al., 2009), which provides a brief period to intervene in this transition to behavioral action (Hepp et al., 2020).

Furthermore, preliminary results show the importance of separately investigating short-term predictors of NSSI thoughts and urges in addition to NSSI behavior. In line with the ideation-to-action framework, recent research by Kranzler and colleagues (2018) points out that momentary changes in both positive affect and negative affect predicted greater intensity of NSSI thoughts, while only increases in negative affect predicted NSSI behavior. In contrast, Kiekens and colleagues (2020) found that negative affect predicted NSSI, yet, when accounted for NSSI thoughts, negative affect was no longer significantly predictive of NSSI. Additionally, Snir and colleagues (2015) found that an increase in general negative affect and self-punishment was associated with NSSI urges and not NSSI behavior. However, research concerning NSSI thoughts and urges is fairly limited despite their clinical value.

1.5.5.2. Short-Term Risk Predictors of NSSI Thoughts and Urges. An NSSI urge is the strong desire to engage in NSSI behavior, while NSSI thoughts are considered milder ideas of hurting oneself. However, in most studies, NSSI thoughts and NSSI urges are often used interchangeably (Hepp et al., 2020). In the current dissertation, it will be explicitly stated when studies investigated thoughts or urges.

Studies using ESM found a positive association between urges and thoughts with negative affect (Andrewes et al., 2016; Hepp et al., 2020). These positive associations were present at the day level, such that days characterized by more negative affect entailed a higher risk for urges (Hepp et al., 2020). By comparing urge days to non-urge days, Hepp et al. (2021) observed a quadratic trajectory on urge days, demonstrating that participants reported more negative affect when they were to experience an urge. This specific pattern was absent on non-urge days. On the contrary, Snir and colleagues (2015) found that negative affect increased before the urge, continued to rise after, and then gradually faded away. By

investigating these states on a closer time scale, real-time investigation at the momentary level found that urges were associated with concurrent negative affect (Hepp et al., 2021; Humber et al., 2013; Kranzler et al., 2018; Victor, et al., 2019). Concerning temporal associations, negative affect was also found to predict urges from one hour to the next. More specifically, experiencing shame, sadness, anger and anxiety predicted subsequent occurrence of NSSI thoughts and urges (Hepp et al., 2021; Humber et al., 2013; Kiekens et al., 2020; Kranzler et al., 2018; Victor, et al., 2019).

With respect to the association between rumination and urges and thoughts, only one study focused on the interaction between rumination and negative affect. Hughes and colleagues (2019) provide evidence regarding the predictive value of rumination on thoughts. They found that negative affect and rumination both predicted subsequent thought intensity. In addition to these main effects, rumination interacted with feeling overwhelmed and anxiety, but not with overall negative affect when predicting subsequent thought intensity. In this study, overall negative affect was composed by the sum score of 11 different negative affect items, including feeling overwhelmed and anxiety.

To date, only two studies have investigated associations between self-criticism with thoughts and urges at the within-person level. Lear and colleagues (2019) found preliminary evidence that self-criticism indirectly predicted urge intensity through daily cognitions about punishment. In their study, daily guilt preceded urge intensity beyond daily sadness, hostility, and fear. Burke et al. (2021) found that self-criticism had concurrent associations and temporally predicted urge intensity. These results suggest that on moments when self-punishment cognitions are higher, relative to the individuals' average experience of these cognitions, the near-term risk of NSSI urges increases. The latter two studies are in line with the benefits and barriers model (Hooley & Franklin, 2018), suggesting that a critical view of the self may lower the bar for an individual to choose NSSI above another emotion-regulation strategy.

1.6. Importance of an Idiographic Approach in Studying NSSI Urges

The “prototypical” client described in treatment guidelines does not exist, which means clinicians need to tailor therapy to the unique needs of a particular client (also known as the therapist’s dilemma; Piccirillo & Rodebaugh, 2019). These guidelines are often grounded in between-person data, whereas the targets of interventions in psychotherapy are focused on within-person processes and mechanisms (Voelkle et al., 2014). As stated above, personalized models are needed to enhance understanding of the manifestation of NSSI in daily life, which emphasizes the need to shift away from the global question “which

theoretical model is the best” to the specific question “which theoretical model is the best for understanding this persons’ behavior” (Wright & Woods, 2020, p. 15.4). Taking an idiographic approach emphasizes the individual and its unique personal experience, recognizing the fundamental heterogeneity in psychopathology (Wright & Woods, 2020). Acknowledging this heterogeneity may shed light on the inconsistency in results concerning significant short-term predictors of NSSI urges across different studies, as not every predictor may be equally relevant for each individual. By monitoring within-person processes, such as contextual determinants, emotions, thoughts, and urges, researchers and clinicians can respond to the call for more person-centered care in the treatment of NSSI (Lewis & Hasking, 2021; Wright & Woods, 2020).

Multilevel modeling is commonly used to study within-person processes in clinical psychology. However, Piccirillo and Rodebaugh (2019) highlight that these models are not estimating truly person-specific effects. Rather, it provides an *averaged* estimation based on an overarching distribution of individual effects (Conner et al., 2009). A reliable and valid idiographic assessment of NSSI urges can be obtained using single-case (N=1) designs, as each individual’s parameter values are then unconstrained by other participants in the sample (Bentley et al., 2019; Ganz & Ayres, 2018). By comparing multiple single-case studies, researchers and clinicians can obtain a profound understanding and explore significant determinants of the experience of NSSI urges and possible differences across people (Edmonds & Kennedy, 2017).

Importantly, the extent to which individuals experience self-injurious thoughts and urge varies substantially, with fleeting thoughts occurring more frequently than intense urges (Turner et al., 2016, 2018). Fitzpatrick and colleagues (2020) report that the intensity of NSSI urges predict subsequent engagement in NSSI behaviors. Resisting these NSSI urges over a more extended period may be cognitively taxing and depletes one’s ability to control NSSI behaviors once they have begun (Hepp et al., 2020). Intensive monitoring and an idiographic approach in investigating urges can thus be critical as existing research indicates that there is a short timeframe between the occurrence of an NSSI urge and NSSI. Indeed, it has been demonstrated that it typically takes people between 1 to 30 minutes to transition from NSSI urge to NSSI behavior (Nock et al., 2009; Selby et al., 2013; Turner et al., 2016). This provides a brief window of opportunity to intervene and interrupt this transition to NSSI during these elevated risk periods. In sum, to improve clinical treatment for individuals engaging in NSSI and to substantiate current theoretical models of NSSI, more research is

needed to clarify which factors co-occur with or temporally predict NSSI urges (Hepp et al., 2020).

1.7. The Current Study

By taking an idiographic approach, the current ESM study will explore the heterogeneity concerning affective (i.e., negative affect) and cognitive (i.e., rumination and self-criticism) context surrounding NSSI urges across several case illustrations, thereby contributing to the generation of knowledge regarding acute risk of NSSI. We will illustrate this with the use of three case studies (N=1 design). Only three participants were included in this study, as they were the first ones to complete the ESM protocol within the timing and the feasibility of this dissertation.

The current study has two main objectives. The first objective is to evaluate the *momentary associations* between negative affect, rumination, and self-criticism with NSSI urge intensity. Additionally, we will investigate the interaction effects between the affective and cognitive states on NSSI urges. The second objective is to evaluate the *temporal (lagged) associations* of negative affect, rumination, and self-criticism with NSSI urge intensity. We will also evaluate interaction between affective and cognitive states on NSSI urges.

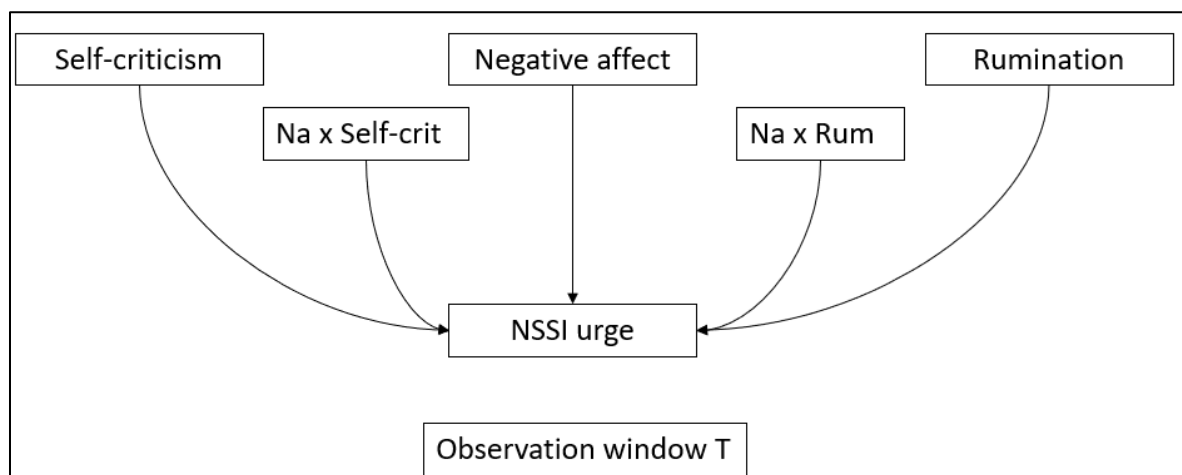
1.7.1. Research Question 1: Contemporaneous Associations Between Negative Affect, Rumination, and Self-Criticism With NSSI Urge Intensity

Existing research indicates a positive association between negative affect and NSSI urges in daily life (Hepp et al., 2020, 2021; Victor et al., 2019). Accordingly, we hypothesize that negative affect will have positive contemporaneous associations with the occurrence of NSSI urges (see Figure 1). To our knowledge, there are no previous studies that investigated momentary associations between rumination and NSSI urges. Hence, we will explore this association. In line with the emotional cascade model (Selby et al., 2013), we will also investigate if the interaction between rumination and negative affect has a momentary association with the occurrence of NSSI urges.

Furthermore, as self-criticism is a salient predictor of NSSI in between-subject designs it would provide valuable information to investigate the momentary association between self-critical thoughts and NSSI urges. Based on the research of Burke et al. (2021) and Lear et al. (2019), we hypothesize a positive contemporaneous association between self-criticism and NSSI urges. In addition, we will investigate the momentary association between the interaction of negative affect with self-criticism on NSSI urges, as theoretical models of NSSI also posit the interaction of cognitive and affective dysregulation as a risk factor for NSSI (Nock, 2010).

Figure 1

Graphical Illustration of the First Research Objective



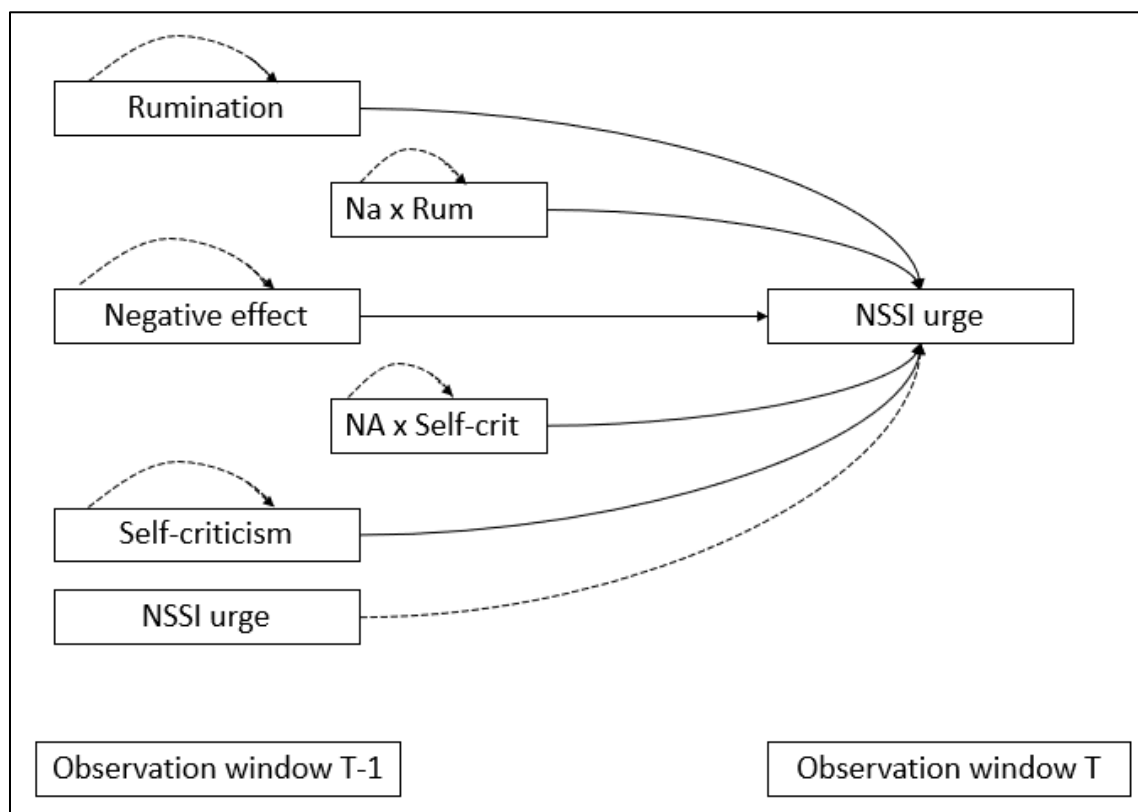
1.7.2. Research Question 2: Temporal Associations Between Negative Affect, Rumination, and Self-Criticism With NSSI Urge Intensity

Research question 1 will provide insight into daily life correlates of NSSI urges. Different from correlates, risk factors temporally precede the outcome of interest and provide insight into the association's direction (Kraemer et al., 1997), which will be the focus of Research question 2. Previous research indicated a temporal association between negative affect and NSSI urges, suggesting that individuals are prospectively more likely to experience NSSI urges when experiencing negative affect (Hepp et al., 2021; Humber et al., 2013; Kranzler et al., 2018; Victor et al., 2019). Hence, we hypothesize that observing an increase of negative affect will lead to subsequent increases in the likelihood of future NSSI urges (See Figure 2). Concerning rumination, no previous study investigated a temporal relation with NSSI urges. The current study will explore the temporal relationship between state rumination and subsequent NSSI urges. Based on existing knowledge (Selby et al., 2015) and the emotional cascade model (Selby et al., 2013), we hypothesize that the interaction between state rumination and negative affect will prospectively predict the occurrence of NSSI urges. Lastly, based on the limited literature on the real-time predictive value of self-criticism, we hypothesize that high self-criticism in one observation window will predict the occurrence of NSSI in the next observation window (Burke et al., 2021). In other words, we hypothesize that when self-criticism is high, the urge to self-injure could be increased in the following hours as the threshold to choose NSSI above another emotion-regulation strategy will be lowered (Hooley & Franklin, 2018). Moreover, as no other study investigated the temporal

effect of the interaction between self-criticism and negative affect on the occurrence of NSSI urges, this study will exploratively investigate this temporal effect.

Figure 2

Graphical Illustration of the Second Research Objective



Note. Solid arrows indicate effects of interest. Dotted arrows represent autoregressive effects.

2. Methods

2.1. Patients and Procedure

For the purpose of this thesis, three patients were selected from an ongoing study (The DAILY Project: A self-monitoring study to support recovery from self-injurious thoughts and behaviors in daily life) that started in July 2021. Patients included in the DAILY Project are adolescents and (young) adults between 15 and 39 years old who receive residential or ambulant mental health care and reported at least 3 NSSI acts in the month before enrolment. All three patients included in the current study were women (patient one, patient two, and patient three), respectively 18, 17, and 27 years old. These particular patients were selected because they were the first to complete the ESM protocol of the study.

The DAILY project consisted of three phases. In the first phase, patients and mental health professionals received information about the study and were briefed about the informed consent. After providing the informed consent, patients and mental health professionals completed an online baseline self-report questionnaire. In addition, patients were interviewed by a clinical psychologist about the presence of mental disorders and a history of NSSI characteristics. During the first phase, patients and therapists also received training on completing the ESM protocol via m-Path, a user-friendly and secure smartphone app and platform for real-time and real-world data collection (Mestdagh et al., 2022). The second phase, which started on the morning after the first session, involved a four-week ESM protocol with signal and event sampling. Patients were prompted randomly, six times per day in blocks of 1.5-hours, between 10 am and 9.30 pm. Patients were required to answer the prompts within 15 minutes to ensure the collection of ongoing activities and to avoid retrospective reporting. Patients registered the timing of NSSI behavior utilizing an event marker (i.e., a push-button) on a wearable wireless band of IMEC, which can also continuously track movement, heart rate, skin conductance, and temperature.

When patients indicated they were in distress and risk of engagement in NSSI was high (defined as a score > 5 on urge intensity), they were provided with a brief follow-up assessment and contact details of relevant support organizations and confidants. Following the four-week ESM period, the patient and their mental health professional discussed the monitored data. After this session, clients provided feedback concerning this session and both patients and therapists completed an online questionnaire assessing the tool's perceived utility. The third phase of the study involved an optional online qualitative interview (i.e., helpfulness of self-monitoring and clinical review in the therapy process) and two brief online follow-up assessments after 4 and 12 weeks. The follow-up assessments measured

engagement in NSSI and comorbid behaviors since the last assessment. For the purpose of the current study, only the baseline measures and regular ESM questionnaire prompts were included.

To encourage compliance, patients received a combination of feedback and financial compensation of a minimum of €20 and a maximum of €100. Patients received €35 if compliance to the ESM questionnaires exceeded 33%, €70 if compliance to the ESM questionnaires exceeded 65%, and €100 if compliance to the ESM questionnaires exceeded 83%. In other scenarios, the patients received €20 as compensation. Furthermore, mental health professionals received €10 when they completed an evaluation questionnaire after the feedback session. The study's protocol was approved by the Ethics Committee Investigation UZ/KU Leuven. All procedures were in accordance with the current version (2013) of the principles of the Declaration of Helsinki and the principles of good clinical practice.

2.2. Baseline Measures

At baseline, patients were interviewed with the Self-Injurious Thoughts and Behaviors Interview-Revised (SITBI-R, Fox et al., 2020) and the SCID-5s (Structured Clinical Interview for the DSM 5-short; American Psychiatric Association, 2017). A clinical psychologist administered the following sections of the SCID-5 (American Psychiatric Association, 2017): mood disorder, anxiety disorder, substance use disorder, post-traumatic stress-disorder, and eating disorder. Both NSSI and suicidal thoughts and behaviors were assessed with the SITBI-R (Fox et al., 2020), which is used to measure the presence, frequency, and characteristics of suicide and self-harming thoughts and behaviors. Both interviews have been proven to be acceptable, reliable and valid interviews (Fox, et al., 2020; Regier et al., 2013).

2.3. Ecological Momentary Assessment

Momentary negative affect was assessed by asking the respondents at each prompt to what extent they currently experienced seven negative emotions (i.e., “Right now, I feel”: anxious, stressed, irritated, sad, empty, insecure, lonely). Patients rated each emotion on a 7-point Likert scale ranging from 1 (*not at all*) to 7 (*very much*). The selection of these emotions was based on the conceptual range of negative emotions within the quadrants of the affective circumplex, which are defined by the dimensions of valence and arousal (Russell, 2003). The Cronbach's alfa reliability statistic of negative affect for patient one, two, and three was respectively .88, .57, .72.

To measure momentary rumination, the ESM survey included the question: “Right now, I repeatedly think about the same problem”. Patients rated the question on a 7-point Likert scale ranging from 1 (*not at all*) to 7 (*very much*).

To capture self-criticism, patients were asked at each prompt if they were disappointed in themselves (i.e., “Right now, I feel disappointed in myself”) using a 7-point Likert scale ranging from 1 (*not at all*) to 7 (*very much*).

NSSI urge intensity was assessed by asking the patients at each prompt to indicate how strongly they felt the urge to self-injure (i.e., “Right now, how strong is the urge to self-injure without the intent to end your life?”). Patients could indicate how strong this urge was, using a 7-point Likert-scale ranging from 1 (*not at all*) to 7 (*very much*). An urge was considered present when the patient rated a score higher than 1 on NSSI urge intensity.

2.4. Statistical Analyses

The descriptive results provide initial insight into the relevant constructs and give a description of the means and standard deviations of daily NSSI urge and the affective and cognitive states (i.e., negative affect, rumination, and self-criticism). Additionally, the trajectory of NSSI urge intensity and the intensity of the affective and cognitive states over the ESM-period was mapped for the three patients.

To provide insight into contemporaneous and temporal associations of the affective and cognitive states with NSSI urges, vector autoregressive models were constructed within the Dynamic Structural Equation Modeling Framework (DSEM) in Mplus-version 8 (Asparouhov et al., 2018; Hamaker et al., 2018). Single level time-series analyses were conducted using the data of the three patients separately. Contemporaneous associations (Research question 1) between the affective and cognitive states and NSSI urges were examined using Residual DSEM (RDSEM). When using intensive longitudinal data, measurements are autocorrelated within people as the outcome at time t is predicted by the outcome at the preceding time $t-1$. RDSEM is often used when estimating cross-sectional models with time series data as it allows to separate the structural and autoregressive proportion of the within-level model (Asparouhov & Muthén, 2020). This separation leads to a simplified interpretation of these two parts of the model. The autoregressive part of the model is absorbed in the residuals and allows for nonindependence of observations. All structural effects are represented by variables observed from the same time period and do not involve variables from different periods in time (Asparouhov et al., 2018). In total, five separate RDSEM models were conducted per patient: three bivariate models for the main effects of negative affect, rumination, and self-criticism and two multivariate models for the main effects and interaction between negative affect and rumination/self-criticism respectively. The interaction term was defined by multiplying negative affect with rumination or self-criticism, where after it was centered by the person mean and added as a covariate in

the analyses. In case the interaction was not significant, we evaluated whether the main effects were independently associated with NSSI urges.

Temporal relationships between the variables of interest and NSSI urges (Research question 2) were examined using regular DSEM. This type of modeling allows investigating the temporal predictive effect of the affective and cognitive states at $t-1$ on NSSI urges at t (McNeish & Hamaker, 2020). Additional models were estimated in which the autoregressive effect of NSSI urges at $t-1$ was taken into account in order to evaluate whether affective states and cognitions predicted NSSI urges above and beyond urges at the previous time point. In total, ten separate DSEM models were conducted for each patient. Three bivariate models were conducted with negative affect, rumination, and self-criticism as temporal predictors of NSSI urge intensity and two multivariate models were considered including these lagged main effects and an interaction between negative affect and rumination/self-criticism at $t-1$ respectively. In addition, we also evaluated whether associations remained significant when controlling for the autoregressive component of NSSI urge in each of the aforementioned models. The interaction term was again defined by multiplying negative affect with rumination or self-criticism, where after it was centered by the person mean. The centered interaction term was lagged and added in the main regression analyses. In case the interaction was not significant, we evaluated whether the main effects were independently associated with NSSI urges. The models within the DSEM are estimated with Bayesian methods using the Markov chain Monte Carlo Gibbs sampler. In the models of the current study, non-informative priors were used for the parameters of interest. Statistical significance was determined by estimating a 95% credibility interval (CI) around each point estimate. Missing data in DSEM is handled using a Kalman filter approach, which ensures that all observations can be used in the analysis and a constant interpretation of lagged relations is maintained.

3. Results

3.1. Case Descriptions

Patient One. Patient one (18 years) reported an onset of NSSI at age 16. In the month before the participation in the study, patient one reported having engaged in NSSI ten times. This patient reported the onset of suicidal thoughts at age 18, with six suicidal thoughts in the month prior to enrolment. Patient one attempted suicide two times in the past year and was diagnosed with several DSM-5 mental disorders, including major depressive disorder (MDD), substance use disorder (stimulants), panic disorder, generalized anxiety disorder, post-traumatic stress disorder (PTSD), and anorexia nervosa at baseline. This patient responded to 164 of the 168 ESM questionnaires, completing 98% of the ESM protocol.

Patient Two. Patient two (17 years) reported an onset of NSSI at age 14. In the month before the participation in the study, patient two reported having engaged in NSSI seven times. Patient two reported the onset of suicidal thoughts at age 16. This patient had no lifetime history of suicide attempts. Patient two was diagnosed with MDD and anorexia nervosa. This patient answered 160 of the 168 ESM questionnaires, completing 95% of the ESM protocol.

Patient Three. Patient three (27 years) reported an onset of NSSI at age 16. In the month before the participation in the study, patient three reported having engaged in NSSI 15 times. Additionally, patient three reported the onset of suicidal thoughts at age 16, with seven thoughts in the month before enrollment. In the course of her life, this person attempted suicide three times. Patient three was diagnosed with MDD, substance use disorder (alcohol), and PTSD at baseline. This patient completed 65% of the ESM protocol by answering 109 of the 168 ESM questionnaires.

3.2. Descriptive Results

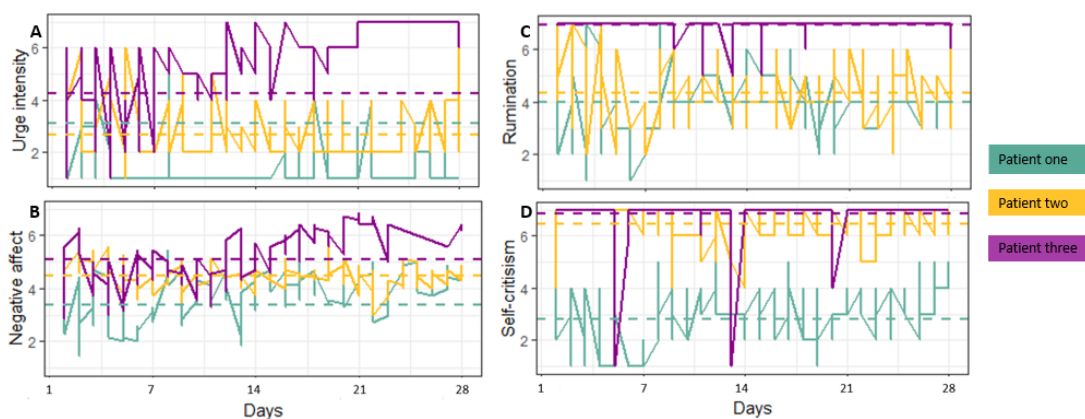
Across the 28-day period, patient one reported 28 urges (intensity > 1). During these moments, the mean intensity of the urges was 3.11 on the 7-point Likert scale ($SD = 1.03$). Patient two reported 159 urges during the ESM period, with a mean NSSI urge intensity of 2.69 on the 7-point Likert scale ($SD = 1.04$). Finally, patient three reported 106 urges over the four weeks, with a mean intensity of 5.22 ($SD = 1.37$) on the 7-point Likert scale. In Table 2, the means and standard deviations of the affective and cognitive variables are presented for each patient.

Table 2*Means and Standard Deviations of Affective and Cognitive Variables*

	Patient one		Patient two		Patient three	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
Negative affect	3.73	0.86	4.48	0.47	5.11	0.95
Rumination	3.97	1.18	4.34	1.11	6.92	0.36
Self-criticism	2.80	1.08	6.46	0.71	6.84	0.86

Note. *M*, mean; *SD*, standard deviation.

In Figure 3, the three patients' trajectories of NSSI urge intensity, negative affect, rumination, and self-criticism are presented on an hourly basis across the 28 days. Intensity ratings of NSSI urges, negative affect, rumination, and self-criticism clearly differed within as well as between the patients over the ESM period. Across the four graphs, patient three consistently reported the highest mean intensity on NSSI urge, negative affect, rumination, and self-criticism. As can be seen, patient one reported lower mean levels of NSSI urge, negative affect, rumination, and self-criticism than patient two.

Figure 3*Trajectory of NSSI Urge Intensity, Negative Affect, Rumination, and Self-Criticism*

Note. Graphical illustration of NSSI urge intensity (A), negative affect (B), rumination (C), and self-criticism (D) (at each prompt) of the three patients over the ESM period. The dotted lines represent the mean intensity across the ESM period.

3.3. Research Question 1: Contemporaneous Associations Between Negative Affect, Rumination, and Self-Criticism With NSSI Urges

We first investigated how the affective and cognitive states were contemporaneously associated with NSSI urges within the same period for each patient (Table 3). This revealed that momentary negative affect was significantly positively related with NSSI urges for each patient, with point estimates ranging from 0.38 to 0.91. Momentary rumination was significantly positively associated with NSSI urges in the same time window for patients one and two, while momentary self-criticism was only significantly positively related with the intensity of NSSI urges in the same time window for patient two.

Table 3

Contemporaneous Associations Between Negative Affect, Rumination, and Self-Criticism With NSSI Urges

	Patient one		Patient two		Patient three	
	<i>B</i> (<i>SD</i>)	95% CI	<i>B</i> (<i>SD</i>)	95% CI	<i>B</i> (<i>SD</i>)	95% CI
Negative affect <i>t</i>	0.38 (0.10)	0.19;0.58	0.91(0.18)	0.56;1.24	0.91 (0.14)	0.62;1.17
Rumination <i>t</i>	0.26 (0.06)	0.14;0.37	0.25 (0.08)	0.09 0.41	0.08 (0.34)	-0.57;0.73
Self-criticism <i>t</i>	0.13 (0.07)	-0.01;0.26	0.30 (0.12)	0.06;0.52	0.06 (0.14)	-0.22;0.33

Note. *B*, median unstandardized point estimate; *SD*, posterior standard deviation; *CI*,

credibility interval. Three separate bivariate autoregressive vector models were conducted with one main effect, represented by the separate rows. Bolded cells indicate that there is a 95% probability that the true population value is not null.

Table 4 shows the multivariate models for negative affect and rumination. Our results show significant main and interaction effects for patient one. We subsequently probed the synergistic interaction effect for patient one (Figure 4). This graph shows that when momentary negative affect and momentary rumination are both high, the likelihood of NSSI urges is strongly elevated compared to when momentary rumination is low. When excluding the non-significant interaction effect for patients two and three, only negative affect was significantly related to NSSI urges in the same time window (Patient two: $\beta=0.80$, 95% CI [0.42,1.20]; patient three: $\beta=0.91$, 95% CI [0.61,1.17]).

Table 4

Contemporaneous Associations Between Negative Affect, Rumination, Their Interaction, and NSSI Urges

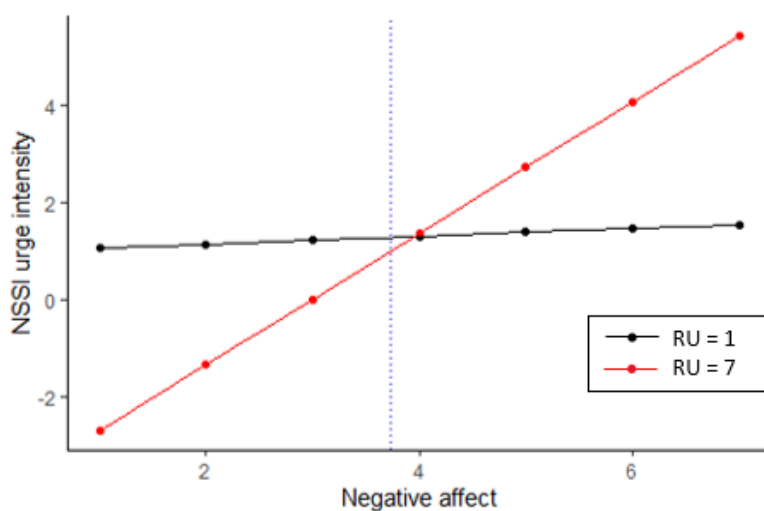
	Patient one		Patient two		Patient three	
	<i>B</i> (<i>SD</i>)	95% CI	<i>B</i> (<i>SD</i>)	95% CI	<i>B</i> (<i>SD</i>)	95% CI
Negative affect <i>t</i>	-0.49(0.25)	-0.99;0.02	0.33(0.60)	-0.88;1.47	-1.07(1.89)	-4.33;3.31
Rumination <i>t</i>	-0.56(0.24)	-1.08;0.09	-0.41(0.60)	-0.41;0.60	-1.37(1.42)	-3.95;1.74
NA*RU <i>t</i>	0.20(0.06)	0.08;0.33	0.11 (0.13)	-0.13;0.38	0.29 (0.28)	-0.35;0.77

Note. *B*, median unstandardized point estimate; *SD*, posterior standard deviation; CI,

credibility interval; NA, negative affect; RU, rumination. Bolded cells indicate that there is a 95% probability that the true population value is not null.

Figure 4

The Synergistic Interaction Effect Between Negative Affect and Rumination on NSSI Urge Intensity for Patient One



Note. The blue dotted line represents the mean of negative affect for patient one. The mean of rumination (RU) is 3.97. The values below zero are extrapolated.

Table 5 shows the multivariate models for negative affect and self-criticism. As can be seen, the main effect of self-criticism *t* and the interaction term were significantly related to NSSI urge *t* for patient one. When probing the synergistic interaction term for patient one

(Figure 5), it can be seen that when high levels of momentary negative affect and momentary self-criticism co-occur, the likelihood of NSSI urges was again strongly elevated compared to when momentary self-criticism was low.

Table 5

Contemporaneous Associations Between Negative Affect, Self-Criticism, Their Interaction and NSSI Urges

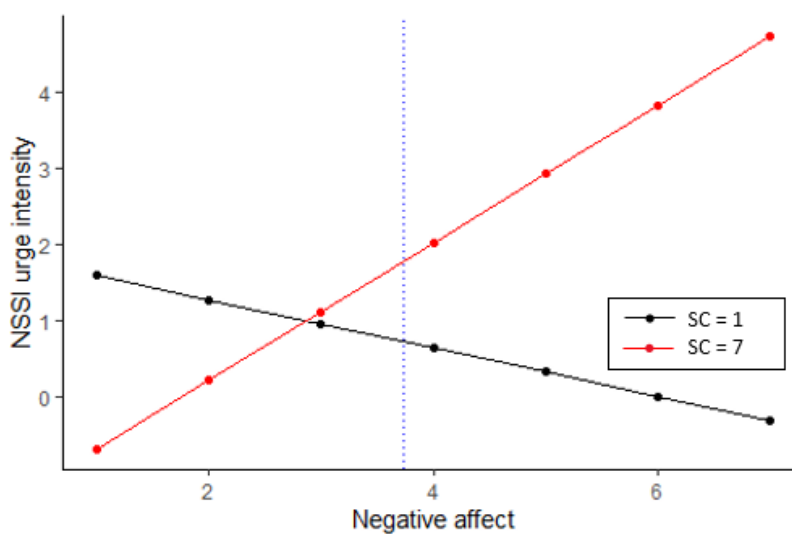
	Patient one		Patient two		Patient three	
	<i>B</i> (<i>SD</i>)	95% CI	<i>B</i> (<i>SD</i>)	95% CI	<i>B</i> (<i>SD</i>)	95% CI
Negative affect <i>t</i>	-0.11(0.19)	-0.49;0.25	-1.26(1.33)	-3.84;1.60	0.72(1.09)	-1.25;1.56
Self-criticism <i>t</i>	-0.81(0.26)	-1.37;-0.32	-1.30(0.90)	-3.10;0.59	-0.16(0.70)	-1.02; 3.37
NA*SC <i>t</i>	0.21(0.07)	0.08;0.34	0.32 (0.20)	-0.10;0.72	0.03 (0.16)	-0.36;0.27

Note. *B*, median unstandardized point estimate; *SD*, posterior standard deviation; CI

credibility interval; NA, negative affect; SC, self-criticism. Bolded cells indicate that there is a 95% probability that the true population value is not null.

Figure 5

The Synergetic Interaction Effect Between Negative Effect and Self-Criticism on NSSI Urge Intensity for Patient One



Note. The blue dotted line represents the mean of negative affect for patient one. The mean of self-criticism (SC) is 2.80. The values below zero are extrapolated.

In that scenario, we see a negative trend in Figure 5, which indicates that the compound effect is greatest when *both* negative affect and self-criticism are elevated. When excluding the interaction effect for patient two and three, only negative affect remained significantly related to NSSI urge in the same time window for patient two ($\beta=0.85$, 95% CI [0.47,1.22]) and patient three ($\beta=0.80$, 95% CI [0.62,1.19]).

3.4. Research Question 2: Temporal Associations Between Negative Affect, Rumination, and Self-Criticism With NSSI Urges

Next, we considered temporal associations of negative affect, rumination, and self-criticism with NSSI urges. As can be seen in bivariate models, negative affect at $t-1$ positively predicted the intensity of NSSI urges at t for all three patients (Table 6). However, the strength of this association varied considerably, with point estimates ranging from 0.19 to 0.88. When controlling for NSSI urges at $t-1$, the lagged effect of negative affect on NSSI urges became weaker but remained significant for patients two and three. For patient one, negative effect at $t-1$ was no longer predictive of the intensity of NSSI urges at t when taking the effect of NSSI urges at $t-1$ into account. In this respect, it is interesting to note that for patient two, negative affect, but not the autoregressive effect of NSSI urges, was a significant predictor of the intensity of NSSI urges in daily life.

Table 6

Temporal Associations Between Negative Affect and NSSI Urges

	Patient one		Patient two		Patient three	
	<i>B</i> (<i>SD</i>)	95% CI	<i>B</i> (<i>SD</i>)	95% CI	<i>B</i> (<i>SD</i>)	95% CI
Negative affect $t-1$	0.19 (0.09)	0.02;0.36	0.88 (0.20)	0.47;1.25	0.88 (0.15)	0.57;1.16
Negative affect $t-1^a$	0.04 (0.07)	-0.08; 0.17	0.64 (0.27)	0.19;1.23	0.41 (0.16)	0.14;0.76
NSSI urge $t-1$	0.48 (0.08)	0.29;0.62	0.22 (0.17)	-0.19;0.46	0.48 (0.11)	0.19;0.64

Note. *B*, median unstandardized point estimate; *SD*, posterior standard deviation; CI,

credibility interval. Bolded cells indicate that there is a 95% probability that the true population value is not null.

^a Multivariate analysis with autoregressive component of NSSI urge.

Concerning rumination, bivariate analyses indicated that rumination at $t-1$ positively predicted NSSI urges at t only for patient two (Table 7). When controlling for the autoregressive effect of NSSI urges, this person-specific relation became weaker but remained significant for patient two. In these multivariate models, NSSI urge $t-1$ was also a significant predictor for NSSI urge t for all patients, with estimates ranging from 0.31 to 0.71.

Table 7

Temporal Associations Between Rumination and NSSI Urges

	Patient one		Patient two		Patient three	
	<i>B (SD)</i>	95% CI	<i>B (SD)</i>	95% CI	<i>B (SD)</i>	95% CI
Rumination $t-1$	0.14 (0.08)	-0.02;0.30	0.44 (0.10)	0.22;0.64	-0.30 (0.95)	-2.01;1.72
Rumination $t-1^a$	0.02 (0.07)	-0.11;0.64	0.30 (0.12)	0.07;0.56	0.06 (0.57)	-1.23;1.08
NSSI urge $t-1$	0.43 (0.09)	0.23;0.58	0.31 (0.13)	0.00;0.52	0.71 (0.57)	0.57;0.81

Note. *B*, median unstandardized point estimate; *SD*, posterior standard deviation; *CI*,

credibility interval. Bolded cells indicate that there is a 95% probability that the true population value is not null.

^a Multivariate analysis with autoregressive component of NSSI urge.

Concerning self-criticism, bivariate analyses indicated that self-criticism at $t-1$ positively predicted NSSI urges at t only for patient one (Table 8). When accounting for the autoregressive effect of NSSI urge, this person-specific relation became non-significant. In these multivariate models, only NSSI urge $t-1$ was a significant predictor for NSSI urge t for all patients, with estimates ranging from 0.38 to 0.70.

Table 8*Temporal Associations Between Self-Criticism and NSSI Urges*

	Patient one		Patient two		Patient three	
	<i>B</i> (<i>SD</i>)	95% CI	<i>B</i> (<i>SD</i>)	95% CI	<i>B</i> (<i>SD</i>)	95% CI
Self-criticism <i>t-1</i>	0.16(0.08)	0.01;0.33	0.17(0.19)	-0.24;0.53	-1.04(0.45)	-0.94;0.80
Self-criticism <i>t-1</i> ^a	0.07 (0.07)	-0.05;0.22	-0.03(0.16)	-0.36; 0.27	-0.07(0.32)	-0.70;0.50
NSSI urges <i>t-1</i>	0.38 (0.10)	0.17;0.55	0.49(0.11)	0.24;0.64	0.70 (0.06)	0.56;0.81

Note. *B*, median unstandardized point estimate; *SD*, posterior standard deviation; CI,

credibility interval. Bolded cells indicate that there is a 95% probability that the true population value is not null.

^a Multivariate analysis with autoregressive component of NSSI urge.

Finally, we considered multivariate models for the main temporal effects and their interaction. As can be seen in Tables 9-10, none of the interaction effects were significant in predicting subsequent NSSI urges². When excluding the interaction effect, we found no temporal effects of negative affect ($\beta=-0.06$, 95% CI [-1.09,0.79]) or rumination ($\beta=0.23$, 95% CI [-0.62,0.80]) for patient one. However, the autoregressive component of NSSI urges ($\beta=0.46$, 95% CI [0.25,0.62]) remained significant when accounting for both negative affect and rumination. For patient two, we found that negative affect ($\beta=0.55$, 95% CI [0.08,1.05]) but not rumination ($\beta=0.27$, 95% CI [-0.02,0.50]) at *t-1* predicted NSSI urges at *t*. However, negative affect *t-1* also became non-significant ($\beta=0.43$, 95% CI [-0.11,1.07]) once the autoregressive effect of NSSI urges ($\beta=0.15$, 95% CI [-0.19,0.43]) was included. For patient three, we found a temporal effect of negative affect ($\beta=0.89$, 95% CI [0.55,1.17]) but not of rumination ($\beta=-.16$, 95% CI [-1.81,1.52]). Negative affect ($\beta=0.42$, 95% CI [0.16,0.87]) remained significant when taking into account the autoregressive effect of NSSI urges ($\beta=0.45$, 95% CI [0.09,0.64]). Similar findings were obtained when considering the temporal multivariate model with negative affect and self-criticism as the main effects. In sum, across all models (Tables 6-10), different predictive relations emerged across the three patients.

² The models including the interaction effect did not converge for patient three.

Table 9*Temporal Associations Between Negative Affect, Rumination, Their Interaction and NSSI**Urges*

	Patient one		Patient two	
	<i>B (SD)</i>	95% CI	<i>B (SD)</i>	95% CI
Negative affect <i>t</i> -1	-0.20 (0.35)	-0.89;0.46	0.25 (0.63)	-1.04;1.44
Rumination <i>t</i> -1	-0.03 (0.35)	-0.71;0.65	0.04 (0.65)	-1.32;1.21
NA*RU <i>t</i> -1	0.05 (0.09)	-0.13;0.22	0.06 (0.14)	-0.19;0.34

Note. *B*, median unstandardized point estimate; *SD*, posterior standard deviation; *CI*,

credibility interval; NA, negative affect; RU, rumination. Bolded cells indicate that there is a 95% probability that the true population value is not null.

Table 10*Temporal Associations Between Negative Affect, Self-Criticism, Their Interaction and NSSI**Urges*

	Patient one		Patient two	
	<i>B (SD)</i>	95% CI	<i>B (SD)</i>	95% CI
Negative affect <i>t</i> -1	-0.08 (0.27)	-0.61;0.43	0.35 (2.21)	-4.16;4.42
Self-criticism <i>t</i> -1	-0.10 (0.35)	-0.76;0.59	-0.52 (1.47)	-3.54;2.25
NA*SC <i>t</i> -1	0.04 (0.09)	-0.13;0.21	0.09 (0.34)	-0.55;0.76

Note. *B*, median unstandardized point estimate; *SD*, posterior standard deviation; *CI*,

credibility interval; NA, negative affect; SC, self-criticism. Bolded cells indicate that there is a 95% probability that the true population value is not null.

4. Discussion

To improve risk assessment and crisis intervention, advancing knowledge about which within-person processes determine *when* an individual is at high risk for engaging in NSSI in the daily life environment is important (Kiekens et al., 2021; Rodríguez-Blanco et al., 2018). To this end, taking an idiographic approach is critical, as it acknowledges the heterogeneity across individuals in their affective and cognitive context surrounding NSSI urges, a theoretically salient near-term risk factor of NSSI (Fitzpatrick et al., 2020). The current ESM study adds to this literature as contemporaneous (i.e., momentary) and temporal associations between negative affect, rumination, and self-criticism with NSSI urges were investigated using data from three young individuals that participated in a highly intensive longitudinal design in daily life. Three main findings emerged in our study that require further comment. First, results revealed each individual's unique experience, as not every correlate or predictor was equally relevant for each patient. Second, we observed stronger contemporaneous associations than temporal associations with NSSI urge intensity. Third, the only factor that consistently predicted NSSI urge intensity across all individuals was the strength of NSSI urges at the previous assessment. In what follows, each of these findings will be discussed in more detail.

First, substantiating the recent calls for more personalized models in psychopathology (Wright & Woods, 2020), our study demonstrated that negative affect, rumination, and self-criticism were not equally relevant or meaningful for each participant in explaining elevated risk for NSSI urges. Corroborating these recent calls, we found different patterns of results across all cases included in the study, which seem to suggest that variation in risk generation is rule rather than exception (Wright & Woods, 2020). Across the three patients, the intensity of NSSI urges varied considerably across hours within and between the three participants, highlighting the need for continuous monitoring with idiographic approaches (Kiekens et al., 2020; Kleiman & Nock, 2018). Yet, most models in psychopathology are derived from nomothetic principles (i.e., predictors of NSSI that are true of all individuals in a certain population), essentially requiring the clinician to fit the person to the model. However, as shown in our study, some nomothetic principles contained in clinical models may or may not apply to some individuals, which could explain the highly varied responses to interventions (Wright & Woods, 2020). Furthermore, the affective and cognitive variables also fluctuated over short periods of hours and days within each patient, demonstrating their highly personal and dynamic nature. These findings illustrate that intensive real-time monitoring is required to capture these fluctuating and rapid changes to get a better understanding of the processes

leading up to NSSI urges in daily life (Burke et al., 2021; Kiekens et al., 2021; Kleiman et al., 2018).

In line with previous research, negative affect co-occurred and temporarily preceded NSSI urges for all three patients (Andrewes et al., 2016; Hughes et al., 2019; Kranzler et al., 2018). In other words, elevated levels of negative affect are an indication that these three patients are at higher risk of experiencing increases in NSSI urge intensity. This finding substantiates the use of NSSI as a method of regulation of aversive emotions (Nock et al., 2009; Rodríguez-Blanco et al., 2018). Furthermore, our results provide initial insight into the momentary and temporal associations between rumination and NSSI urges, as no other research investigated these real-time associations. When patient one and two reported ruminative thoughts, they experienced elevated levels of NSSI urges at the same time. Interestingly, only for patient two, these elevated levels of rumination also temporarily preceded NSSI urges. Rumination did not appear to be a real-time correlate or risk factor of NSSI urges for patient three, despite having consistently elevated levels of rumination compared to the other two patients. The absence of the relation between rumination and its near-term risk for NSSI urges for patient three, may be explained by the chronic high level of rumination in this person's life without variability in ruminative thoughts. An additional explanation could be that patterns of real-time predictors may differ for individuals who engaged in NSSI for over a longer period. Patient three, who engaged in NSSI for 10 years and where rumination seems to be chronically high, might have other predictors leading up to increase risk of NSSI urges, compared to patient one and two, who engaged in NSSI for, respectively two and three years, and where rumination is highly variable. Similarly, only for patient two, NSSI urges co-occurred in the context of self-criticism, while self-criticism temporally preceded NSSI urges, only for patient one. While the benefits and barriers model of Hooley and Franklin (2018) suggest that self-criticism weakens individuals' potential inherent barrier to NSSI and adds to increasing levels of urges to consider NSSI as a coping strategy, we found that this risk process might not be omnipresent across individuals with a history of NSSI. Taken together, these findings clearly illustrate the value of formulating and testing hypothesized individual causal chains about the proximal factors that increase risk for NSSI through urge intensity in daily life.

Importantly, these proximal factors do not occur in a vacuum in daily life but can interact with each other. For instance, we found a momentary, synergistic interaction effect for patient one of rumination and negative affect in relation with NSSI urges. As the emotional cascade model (Selby et al., 2013) posits, individuals may engage in NSSI to

distract themselves from an aversive state, which may be resulting from negative affect and rumination reinforcing each other. However, at the same time, it should be mentioned that this pattern of results was only observed for one patient. Similarly, only for patient one, we found that when momentary elevated levels of both negative affect and self-criticism co-occur the compound effect on NSSI urges was the greatest. As described in the benefits and barriers model (Hooley & Franklin, 2018), both reducing negative affect and the gratification of self-critical desires are two benefits that might explain why individuals engage in NSSI instead of another emotion-regulation strategy. Our findings thus indicate that when two of these benefits are simultaneously experienced, the real-time risk of strong NSSI urges is accumulated compared to when only one benefit is present for this particular individual. Although these findings are in need of replication, they demonstrate the importance of person-specific care in clinical practice. We do not argue that these between-person models are not informative, they are just only informative for some individuals, not for everyone in the population (Kaurin et al., 2022).

A second major finding was that associations between the affective and cognitive correlates and NSSI urges were stronger than short-term temporal associations. Additionally, only momentary interaction effects were found. Likewise, in studies concerning suicidal ideation or NSSI thoughts, mostly momentary associations are found with temporal associations being absent (Ben-Zeev et al., 2012; Burke et al., 2021; Dillon et al., 2022; Kleiman et al., 2017). There may be two explanations for this: (1) The affective and cognitive variables are only insightful in identifying NSSI urges in the moment or (2) the connection between these affective and cognitive variables and NSSI urges occur in closer temporal proximity to each other than we captured with our design, implying fast occurring processes that could not be captured in the used time intervals (approximately 1.5 hour). While the directionality of effects cannot be determined in these contemporaneous associations, researchers have emphasized the importance of investigating these momentary relations in discovering fast-moving psychological dynamics, as such causal processes may occur much faster (i.e., seconds or minutes) than within a few hours (Epskamp et al., 2018; Kiekens et al., 2020). To uncover these potential dynamic microprocesses leading up to NSSI urges, future ESM studies should include multiple beeps over shorter periods (i.e., burst assessment; Kiekens et al., 2020) when individuals indicate high levels of NSSI urges. This would also increase the power to detect near-term risk factors (Kaurin et al., 2022).

A third important contribution of this study was evaluating the extent to which affective and cognitive states provided unique information on the near-time risk of NSSI

urges, beyond the effect of NSSI urges at a previous point in time (i.e., incremental predictive validity). Interestingly, while the incremental predictive validity of the affective and cognitive states differed across individuals, NSSI urges at a previous assessment (i.e., autoregressive component of NSSI urges) were consistently predictive of NSSI urges for all three patients. The autoregressive component can be interpreted as the tendency of NSSI urges to sustain themselves and thus persist or gradually intensify over the course of 1.5 hours, regardless of the context. In line with other studies, these results therefore support the conceptualization of increasing amplification of NSSI urge intensity (Andrewes et al., 2016; Fitzpatrick et al., 2020; Selby & Joiner, 2009; Wright & Woods, 2020). As our results demonstrate that NSSI urge intensity is already of importance 1.5 hours before the current NSSI urge, it highlights the importance of investigating what causes the NSSI urges to self-sustain or worsen over this period (i.e., which factors determine the strength of the autoregressive component). Also, future research should investigate factors that contribute to increasing levels of NSSI urge intensity, when controlling for the effect of NSSI urges intensity at a previous point in time. In our three case studies, negative affect only added to the risk stratification of increased NSSI urge intensity for patient two and three beyond the intensity of NSSI urges at a previous point in time. It should, however, be noted that patient one reported far fewer NSSI urges (28) compared to patient two (159) and three (106), which may have caused power to be limited to find the unique effect of multiple predictors for patient one (Victor et al., 2019). Although accounting for the autoregressive component of NSSI urges is crucial for identifying targets for clinical interventions, most EMA studies to date do not take this into account. Failing to consider the incremental predictive validity of certain factors, might thus lead to suboptimal interpretations and targets for interventions, as a high autoregressive component can be indicative of prolonged NSSI urges irrespective of the context. Conversely, this implies that contextual factors should be included when they provide unique information to enable person-tailored intervention. These findings also stress the meaningfulness of investigating how to increase an individuals' self-efficacy to resist and decrease the urge to self-injure, as NSSI duration is an important indication (i.e., because of the cognitive taxing characteristics) of engagement in NSSI (Hepp et al., 2020; Kiekens et al., 2020).

4.1. Limitations and Future Research Directions

The findings of this study should be considered in the context of several significant limitations. First, our study aimed to provide initial insight into how NSSI urges occur in daily life by investigating three case studies. As described, these three patients were all women, between 17 and 27 years old, and had engaged frequently in NSSI. Future studies

could use larger and more diverse case studies to provide a clear picture of the variety of correlates, and short-term predictors of NSSI urges across individuals with different backgrounds and severity profiles (e.g., including individuals who behaviorally ceased NSSI but still have NSSI urges).

Second, while one of the major benefits of ESM is its ecological validity, a downside is that researchers cannot evaluate with how much care patients fill in each ESM questionnaire, which can impact the reliability and validity of the ESM measures. Third, although a reduction in recall bias is a strength of ESM, it uses self-report questionnaires relying on the ability of participants to have the introspective capacities to accurately describe their feelings and thoughts. Additionally, our study included one-item measures of rumination, self-criticism, and NSSI urge intensity to reduce the burden of the questionnaires over the ESM period. However, this does not allow us to inspect the reliability of these momentary measures. Addressing these shortcomings, future research could use a multi-item assessment of these variables, as was done for negative affect in our study. Using a multi-item assessment also enables the possibility of investigating the unique effect of specific emotions or thoughts (e.g., negative affect often being the composite score of different negative feelings such as irritated, sad, lonely,...) on NSSI urge intensity (Weermeijer et al., 2022), which was beyond the scope of this thesis. For instance, Hughes and colleagues (2019) found that not general negative affect (i.e., the composite score) but feeling overwhelmed and anxiety (i.e., specific items included in the composite term negative affect) predicted subsequent NSSI thought intensity. Additionally, future studies can include different qualitative aspects related to NSSI urges (e.g., duration; Fitzpatrick et al., 2020; Turner et al., 2019) as well as physiological measures (e.g., heart rate and skin temperature) with the use of wearable bands (Kleiman et al., 2019). Related to this, a fourth limitation is the use of composite scores that ignore the optimal weighting of items for a specific individual, which affects scale reliability (Weermeijer et al., 2022). Weermeijer et al. (2022) indicated that factor loadings of, for instance the multi-item assessment of momentary negative affect, are different at the within-person level compared to the between-person level (Eadeh et al., 2020; Möwisch et al., 2019). As was represented in our data, Cronbach's alpha for negative affect ranged between .57 and .88 across the three patients, indicating that for patient two (alpha = .57) negative affect composed out of the 7 items is not equally reliable as for the other two patients. As the pattern of factor loadings might differ across individuals, future work is encouraged to evaluate measurement invariance before drawing conclusions based on the results (Weermeijer et al., 2022). Fifth, in this dissertation, only regular assessments within 1.5 hourly intervals were

included. As discussed, this did not enable us to track immediate dynamic processes surrounding the occurrence of NSSI urges. Future studies could integrate burst assessments (i.e., multiple beeps over shorter time periods; Kiekens et al., 2020) when individuals report intense NSSI urges to uncover fast-occurring causal processes.

Sixth, consistent with the ideation to action framework (Klonsky & May, 2015), different short-term predictors might precede NSSI urges and NSSI. Our study focused on within-person processes of NSSI urges and was thus unable to explain how individuals transition from NSSI urges to NSSI. Studies demonstrate that individuals experience considerably more NSSI urges than acts, implying that most urges do not eventually result in NSSI acts (Hepp et al., 2020). Therefore, future studies should include both NSSI urges and NSSI to provide insight into which within-person processes cause one to move from NSSI urges to engagement in NSSI. Additionally, future research is encouraged to use promising statistical techniques, such as two-step models and Group Iterative Multiple Model Estimation (GIMME; Gates & Molenaar, 2012). Two step-models can distinguish between (1) the occurrence of an NSSI urge and (2) the intensity of that specific urge, which is in our study taken together. The essence of GIMME is that it estimates both (1) idiographic models and (2) commonalities among individuals (i.e., short-term risk factors or correlates that emerge in most participants). This allows to compare multiple case studies to investigate within-person processes leading up to NSSI urges, which could lay out potential building blocks for bottom-up models of NSSI that allow fitting the model to the person (Wright, 2011; Wright & Woods, 2020). Moreover, future research could investigate whether (1) different profiles (e.g., severity, duration, number of NSSI urges or urges actually leading up to NSSI engagement) or trajectories (e.g., increasing or high overall risk; Goldston et al., 2016) can be meaningfully identified based on a combination of correlates or short-term predictors of NSSI urges and (2) which personal characteristics (e.g., individuals with depression) can partially explain a certain profile or trajectory (Kiekens et al., 2020, 2021; Kleiman et al., 2018).

4.2. Clinical Implications

The current study substantiates the need for more person-centered care in the treatment of NSSI. As the well-reflected heterogeneity in our study is fundamental in psychopathology, greater precision in characterizing individual's within-person processes will translate into a better match of intervention to individuals and thus result in better treatment responses (Kaurin et al., 2022; Myin-Germeys et al., 2018; Voelkle et al., 2014; Wright & Woods, 2020). Furthermore, given that NSSI urges and its affective and cognitive surroundings fluctuate across hours and days, real-life monitoring can be off added value as a blended care

tool for risk assessment in which the client and clinician can identify triggers or short-term risk factors of NSSI urges (Armeij, 2012). Interestingly, recent, innovative research used ESM data to construct temporal Bayesian network models that accurately predicted elevated near-term risk experiences of rumination, negative affect and engagement in dysregulated behavior such as NSSI (e.g., the model predicted the occurrence of dysregulated behavior with 95% and 100% accuracy depending on whether the diagnosis of borderline personality disorder was present; Selby et al., 2021). Next to better identifying targets for clinical interventions, it might also facilitate psychoeducation (e.g. with use of ESM data visualization) and might make individuals more conscious of relevant processes (Kiekens et al., 2021; Rodríguez-Blanco et al., 2018). The KU Leuven m-Path app is an example of a real-time monitoring tool (Mestdagh et al., 2022) that allows for the implementation of ESM in clinical practice.

In addition to providing insight into the course of NSSI (urges) in daily life, ESM also offers great opportunities to develop new interventions. Ecological momentary interventions (EMIs) use mobile devices to provide support in people's everyday lives and can be tailored to the needs of the individual and toward those moments when intervention is needed (Heron & Smyth, 2010; Myin-Germeys et al., 2016). EMI's have the advantage of being accessible for everyone (Arshad et al., 2020). In these interventions, focusing on NSSI urges is particularly meaningful as researchers demonstrated that individuals transition from NSSI urge to NSSI engagement within a time window of 1-30 minutes, implying a brief window of opportunity to prevent the transition from NSSI urges to engagement in NSSI (Hepp et al., 2020; Kiekens et al., 2020). As suggested by Armeij (2012), NSSI-specific EMI's seem promising when they (1) identify when an individual is at high risk for a NSSI episode and (2) alert the patient to these changes and help them cope with these fluctuations by recommending or guiding through the use of psychotherapy skills. In their newly proposed person-centered framework of self-injury recovery, Lewis and Hasking (2021) emphasize that it is likely that many individuals will continue to experience some degree of NSSI urges, which highlight the need to normalize the occurrence of an NSSI urge also into recovery. Hence, it is important to foster self-efficacy to avoid acting on those urges (Kiekens et al., 2020) and provide ongoing support that facilitates alternative adaptive behaviors that meet the same needs as NSSI (Lewis & Hasking, 2021). Additionally, dialectic behavioral therapy modules related to distress (i.e., by learning problem-focused coping strategies; Turner et al., 2016) or mindfulness techniques (i.e., nonjudgmental emotional awareness and acceptance; Gratz, 2007) could be included to help patients endure moments in which risk for NSSI is elevated (Armeij, 2012). Based on their clinical profile, interventions are recommended to

mainly focus on dealing with sustained urges for patient one (i.e., as only the autoregressive component of NSSI urges provided unique information). For this patient, teaching mindfulness techniques (e.g., urge surfing; Hepp et al., 2020) and increasing self-efficacy to resist urges (e.g., highlighting successes in resisting urges; Dawkins et al., 2021) might be effective. When NSSI urge intensity is high, interventions can prompt this patient to help reduce negative affect, rumination, and self-criticism, as the interaction between these affective and cognitive states were associated with an increase in NSSI urge intensity for patient one. Whereas for patient three, interventions should aim at reducing negative affect (e.g., list with alternative, personalized emotion-regulation strategies; Lewis & Hasking, 2021) in addition to focusing how to deal with sustain urges (i.e., as negative affect provided unique information). This would also help in moments when NSSI urge intensity is high, as negative affect was highly associated with NSSI urge intensity ($\beta = .91$). One example of a promising EMI for individuals who self-injure is a just-in-time intervention (JITAI), which has already shown promising results in mental health research (Wang & Miller, 2020). As discussed for real-time risk for suicidal attempts (Coppersmith et al., 2021), JITAIs also show great potential for individuals engaging in NSSI as it considers the dynamic and heterogeneous nature of NSSI. Therefore, JITAIs provide the individual with the right type of support at the point in time when it is most needed (Kiekens et al., 2021).

4.3. Conclusion

Using three case examples, the current ESM study provided insight into the differences in the affective and cognitive correlates, and short-term predictors of NSSI urges for 28 days in daily life. Although these initial findings require replication, they indicate the need to acknowledge the heterogeneity across individuals' affective and cognitive context surrounding NSSI urges, thereby encouraging research and clinical practice to take on a person-centered approach. These idiosyncratic, contextualized, dynamic processes could serve as optimal building blocks for bottom-up, real-time models of NSSI (urges) that allow uncovering meaningful targets for person-tailored interventions.

5. References

- Ammerman, B. A., Jacobucci, R., Kleiman, E. M., Uyeji, L. L., & McCloskey, M. S. (2018). The relationship between nonsuicidal self-injury age of onset and severity of self-harm. *Suicide & Life-Threatening Behavior*, *48*(1), 31–37. <https://doi.org/10.1111/sltb.12330>
- Ammerman, B. A., Olino, T. M., Coccaro, E. F., & McCloskey, M. S. (2017). Predicting nonsuicidal self-injury in borderline personality disorder using ecological momentary assessment. *Journal of Personality Disorders*, *31*(6), 844–855. https://doi.org/10.1521/pedi_2017_31_278
- Andrewes, H. E., Hulbert, C., Cotton, S. M., Betts, J., & Chanen, A. M. (2016). Ecological momentary assessment of non-suicidal self-injury in youth with borderline personality disorder. *Personality Disorders*, *8*(4), 357–365. <https://doi.org/10.1037/per0000205>
- Anestis, M. D., Khazem, L. R., & Law, K. C. (2015). How many times and how many ways: The impact of number of non-suicidal self-injury methods on the relationship between non-suicidal self-injury frequency and suicidal behavior. *Suicide & Life-Threatening Behavior*, *45*(2), 164–177. <https://doi.org/10.1111/sltb.12120>
- Armev, M. F. (2012). Ecological momentary assessment and intervention in nonsuicidal self-injury: A novel approach to treatment. *Journal of Cognitive Psychotherapy*, *26*(4), 299–317. <https://doi.org/10.1891/0889-8391.26.4.299>
- Armev, 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>
- Arnett, J. J. (2000). Emerging adulthood: A theory of development from the late teens through the twenties. *American Psychologist*, *55*(5), 469–480. <https://doi.org/10.1037/0003-066X.55.5.469>
- Arshad, U., Farhat-ul-Ain, Gauntlett, J., Husain, N., Chaudhry, N., & Taylor, P. J. (2020). A systematic review of the evidence supporting mobile- and internet-based psychological interventions for self-harm. *Suicide and Life-Threatening Behavior*, *50*(1), 151–179. <https://doi.org/10.1111/sltb.12583>
- Asparouhov, T., Hamaker, E. L., & Muthén, B. (2018). Dynamic structural equation models. *Structural Equation Modeling: A Multidisciplinary Journal*, *25*(3), 359–388. <https://doi.org/10.1080/10705511.2017.1406803>

- 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>
- Barrocas, A. L., Giletta, M., Hankin, B. L., Prinstein, M. J., & Abela, J. R. Z. (2015). Nonsuicidal self-injury in adolescence: Longitudinal course, trajectories, and intrapersonal predictors. *Journal of Abnormal Child Psychology*, 43(2), 369–380. <https://doi.org/10.1007/s10802-014-9895-4>
- Benjet, C., González-Herrera, I., Castro-Silva, E., Méndez, E., Borges, G., Casanova, L., & Medina-Mora, M. E. (2017). Non-suicidal self-injury in Mexican young adults: Prevalence, associations with suicidal behavior and psychiatric disorders, and DSM-5 proposed diagnostic criteria. *Journal of Affective Disorders*, 215, 1–8. <https://doi.org/10.1016/j.jad.2017.03.025>
- Bentley, K. H., Kleiman, E. M., Elliott, G., Huffman, J. C., & Nock, M. K. (2019). Real-time monitoring technology in single-case experimental design research: Opportunities and challenges. *Behaviour Research and Therapy*, 117, 87–96. <https://doi.org/10.1016/j.brat.2018.11.017>
- Ben-Zeev, D., Young, M. A., & Depp, C. A. (2012). Real-time predictors of suicidal ideation: Mobile assessment of hospitalized depressed patients. *Psychiatry Research*, 197(1), 55–59. <https://doi.org/10.1016/j.psychres.2011.11.025>
- Bresin, K., & Gordon, K. H. (2013). Changes in negative affect following pain (vs. nonpainful) stimulation in individuals with and without a history of nonsuicidal self-injury. *Personality Disorders: Theory, Research, and Treatment*, 4(1), 62–66. <http://dx.doi.org/kuleuven.e-bronnen.be/10.1037/a0025736>
- Bresin, K., & Schoenleber, M. (2015). Gender differences in the prevalence of nonsuicidal self-injury: A meta-analysis. *Clinical Psychology Review*, 38, 55–64. <https://doi.org/10.1016/j.cpr.2015.02.009>
- Buelens, T., Luyckx, K., Gandhi, A., Kiekens, G., & Claes, L. (2019). Non-suicidal self-injury in adolescence: Longitudinal associations with psychological distress and tumination. *Journal of Abnormal Child Psychology*, 47(9), 1569–1581. <https://doi.org/10.1007/s10802-019-00531-8>
- Burke, T. A., Anne McArthur, B., Daryanani, I., Abramson, L. Y., & Alloy, L. B. (2018). Latent classes of trait affect and cognitive affective regulation strategies are associated with depression, non-suicidal self-injury, and well-being. *Journal of Affective Disorders*, 225, 180–187. <https://doi.org/10.1016/j.jad.2017.08.015>

- Burke, T. A., Fox, K., Kautz, M. M., Rodriguez-Seijas, C., Bettis, A. H., & Alloy, L. B. (2020). Self-critical and self-punishment cognitions differentiate those with and without a history of nonsuicidal self-injury: An ecological momentary assessment study. *Behavior Therapy, 52*(3), 686–697. <https://doi.org/10.1016/j.beth.2020.08.006>
- Burke, T. A., Fox, K., Kautz, M., Siegel, D. M., Kleiman, E., & Alloy, L. B. (2021). Real-time monitoring of the associations between self-critical and self-punishment cognitions and nonsuicidal self-injury. *Behaviour Research and Therapy, 137*, 103775. <https://doi.org/10.1016/j.brat.2020.103775>
- Burke, T. A., Piccirillo, M. L., Moore-Berg, S. L., Alloy, L. B., & Heimberg, R. G. (2019). The stigmatization of nonsuicidal self-injury. *Journal of Clinical Psychology, 75*(3), 481–498. <https://doi.org/10.1002/jclp.22713>
- Caicedo, S. & Whitlock, J.L. (2009). *Top misconceptions about self-injury*. The Fact Sheet Series, Cornell Research Program on Self-Injury and Recovery. Cornell University. Ithaca, NY
- Cipriano, A., Cella, S., & Cotrufo, P. (2017). Nonsuicidal self-injury: A systematic review. *Frontiers in Psychology, 8*, 1946. <https://doi.org/10.3389/fpsyg.2017.01946>
- Claes, L., Houben, A., Vandereycken, W., Bijttebier, P., & Muehlenkamp, J. (2010). Brief report: The association between non-suicidal self-injury, self-concept and acquaintance with self-injurious peers in a sample of adolescents. *Journal of Adolescence, 33*(5), 775–778. <https://doi.org/10.1016/j.adolescence.2009.10.012>
- Claes, L., Luyckx, K., & Bijttebier, P. (2014). Non-suicidal self-injury in adolescents: Prevalence and associations with identity formation above and beyond depression. *Personality and Individual Differences, 61*, 101–104. <https://doi.org/10.1016/j.paid.2013.12.019>
- Claes, L., Luyckx, K., Bijttebier, P., Turner, B., Ghandi, A., Smets, J., Norre, J., Assche, L. V., Verheyen, E., Goris, Y., Hoksbergen, I., & Schoevaerts, K. (2015). Non-suicidal self-injury in patients with eating disorder: Associations with identity formation above and beyond anxiety and depression. *European Eating Disorders Review, 23*(2), 119–125. <https://doi.org/10.1002/erv.2341>
- Claes, L., Soenens, B., Vansteenkiste, M., & Vandereycken, W. (2012). The scars of the inner critic: Perfectionism and nonsuicidal self-injury in eating disorders. *European Eating Disorders Review, 20*(3), 196–202. <https://doi.org/10.1002/erv.1158>
- Claes, L., Vandereycken, W., & Vertommen, H. (2007). Self-injury in female versus male psychiatric patients: A comparison of characteristics, psychopathology and aggression

- regulation. *Personality and Individual Differences*, 42(4), 611–621.
<https://doi.org/10.1016/j.paid.2006.07.021>
- Conner, T. S., Tennen, H., Fleeson, W., & Barrett, L. F. (2009). Experience sampling methods: A modern idiographic approach to personality research. *Social and Personality Psychology Compass*, 3(3), 292–313. <https://doi.org/10.1111/j.1751-9004.2009.00170.x>
- Coppersmith, D. D. L., Bentley, K. H., Kleiman, E. M., & Nock, M. K. (2021). Variability in the functions of nonsuicidal self-injury: Evidence from three real-time monitoring studies. *Behavior Therapy*, 52(6), 1516–1528.
<https://doi.org/10.1016/j.beth.2021.05.003>
- Côté, J. E., & Levine, C. (1988). The relationship between ego identity status and Erikson's notions of institutionalized moratoria, value orientation stage, and ego dominance. *Journal of Youth and Adolescence*, 17(1), 81–99. <https://doi.org/10.1007/BF01538725>
- Daly, O., & Willoughby, T. (2019). A longitudinal study investigating bidirectionality among nonsuicidal self-injury, self-criticism, and parental criticism. *Psychiatry Research*, 271, 678–683. <https://doi.org/10.1016/j.psychres.2018.12.056>
- Daukantaitė, D., Lundh, L.-G., Wångby-Lundh, M., Claréus, B., Bjärehed, J., Zhou, Y., & Liljedahl, S. I. (2020). What happens to young adults who have engaged in self-injurious behavior as adolescents? A 10-year follow-up. *European Child & Adolescent Psychiatry*, 30(3), 475–492. <https://doi.org/10.1007/s00787-020-01533-4>
- Dawkins, J. C., Hasking, P. A., & Boyes, M. E. (2021). Thoughts and beliefs about nonsuicidal self-injury: An application of social cognitive theory. *Journal of American College Health*, 69(4), 428–434. <https://doi.org/10.1080/07448481.2019.1679817>
- Dillon, K. H., Glenn, J. J., Dennis, P. A., Mann, A. J., Deming, C. A., Aho, N., Hertzberg, J. S., DeBeer, B. B., Meyer, E. C., Morissette, S. B., Gratz, K. L., Silvia, P. J., Calhoun, P. S., Beckham, J. C., & Kimbrel, N. A. (2022). Affective states and nonsuicidal self-injury (NSSI): Results from an ecological momentary assessment study of veterans with NSSI disorder. *Suicide and Life-Threatening Behavior*, 52(2), 256–267.
<https://doi.org/10.1111/sltb.12818>
- Eadeh, H.-M., Breaux, R., Langberg, J. M., Nikolas, M. A., & Becker, S. P. (2020). Multigroup multilevel structure of the child and parent versions of the Positive and Negative Affect Schedule (PANAS) in adolescents with and without ADHD. *Psychological Assessment*, 32(4), 374–382. <http://dx.doi.org/10.1037/pas0000796>

- Edmonds, W. A., & Kennedy, T. D. (2017). *An applied guide to research designs: Quantitative, qualitative, and mixed methods*. Thousand Oaks, CA: Sage.
- Epskamp, S., van Borkulo, C. D., van der Veen, D. C., Servaas, M. N., Isvoranu, A.-M., Riese, H., & Cramer, A. O. J. (2018). Personalized network modeling in psychopathology: The importance of contemporaneous and temporal connections. *Clinical Psychological Science: A Journal of the Association for Psychological Science*, 6(3), 416–427. <https://doi.org/10.1177/2167702617744325>
- Erikson, E. H. (1968). *Identity: Youth and crisis*. Norton & Co.
- Esposito, C., Bacchini, D., & Affuso, G. (2019). Adolescent non-suicidal self-injury and its relationships with school bullying and peer rejection. *Psychiatry Research*, 274, 1–6. <https://doi.org/10.1016/j.psychres.2019.02.018>
- First, M., Williams, J., Karg, R., & Spitzer, R. (2015). *Structured clinical interview for DSM-5—Research version (SCID-5 for DSM-5, research version; SCID-5-RV)*. American Psychological Association.
- Fisher, A. J., Medaglia, J. D., & Jeronimus, B. F. (2018). Lack of group-to-individual generalizability is a threat to human subjects research. *Proceedings of the National Academy of Sciences*, 115(27), E6106–E6115. <https://doi.org/10.1073/pnas.1711978115>
- Fitzpatrick, S., Kranzler, A., Fehling, K., Lindqvist, J., & Selby, E. A. (2020). Investigating the role of the intensity and duration of self-injury thoughts in self-injury with ecological momentary assessment. *Psychiatry Research*, 284, 112761. <https://doi.org/10.1016/j.psychres.2020.112761>
- Fox, K. R., Franklin, J. C., Ribeiro, J. D., Kleiman, E. M., Bentley, K. H., & Nock, M. K. (2015). Meta-analysis of risk factors for nonsuicidal self-injury. *Clinical Psychology Review*, 42, 156–167. <https://doi.org/10.1016/j.cpr.2015.09.002>
- Fox, K. R., Harris, J. A., Wang, S. B., Millner, A. J., Deming, C. A., & Nock, M. K. (2020). Self-Injurious Thoughts and Behaviors Interview-Revised: Development, reliability, and validity. *Psychological Assessment*, 32(7), 677–689. <https://doi.org/10.1037/pas0000819>
- Fox, K. R., Huang, X., Guzmán, E. M., Funsch, K. M., Cha, C. B., Ribeiro, J. D., & Franklin, J. C. (2020). Interventions for suicide and self-injury: A meta-analysis of randomized controlled trials across nearly 50 years of research. *Psychological Bulletin*, 146(12), 1117–1145. <https://doi.org/10.1037/bul0000305>

- Fox, K. R., O'Sullivan, I. M., Wang, S. B., & Hooley, J. M. (2019). Self-criticism impacts emotional responses to pain. *Behavior Therapy, 50*(2), 410–420.
<https://doi.org/10.1016/j.beth.2018.07.008>
- Gambetta, D. (2009). *Codes of the underworld: How criminals communicate*. Princeton University Press.
- Gandhi, A., Luyckx, K., Baetens, I., Kiekens, G., Sleuwaegen, E., Berens, A., Maitra, S., & Claes, L. (2018). Age of onset of non-suicidal self-injury in Dutch-speaking adolescents and emerging adults: An event history analysis of pooled data. *Comprehensive Psychiatry, 80*, 170–178.
<https://doi.org/10.1016/j.comppsy.2017.10.007>
- Gandhi, A., Luyckx, K., Maitra, S., Kiekens, G., Verschueren, M., & Claes, L. (2017). Directionality of effects between non-suicidal self-injury and identity formation: A prospective study in adolescents. *Personality and Individual Differences, 109*, 124–129. <https://doi.org/10.1016/j.paid.2017.01.003>
- Ganz, J. B., & Ayres, K. M. (2018). Methodological standards in single-case experimental design: Raising the bar. *Research in Developmental Disabilities, 79*, 3–9.
<https://doi.org/10.1016/j.ridd.2018.03.003>
- Gates, K. M., & Molenaar, P. C. M. (2012). Group search algorithm recovers effective connectivity maps for individuals in homogeneous and heterogeneous samples. *NeuroImage, 63*(1), 310–319. <https://doi.org/10.1016/j.neuroimage.2012.06.026>
- Goldston, D. B., Erkanli, A., Daniel, S. S., Heilbron, N., Weller, B. E., & Doyle, O. (2016). Developmental trajectories of suicidal thoughts and behaviors from adolescence through adulthood. *Journal of the American Academy of Child & Adolescent Psychiatry, 55*(5), 400–407.e1. <https://doi.org/10.1016/j.jaac.2016.02.010>
- Gong, T., Ren, Y., Wu, J., Jiang, Y., Hu, W., & You, J. (2019). The associations among self-criticism, hopelessness, rumination, and NSSI in adolescents: A moderated mediation model. *Journal of Adolescence, 72*, 1–9.
<https://doi.org/10.1016/j.adolescence.2019.01.007>
- Gratz, K. L. (2007). Targeting emotion dysregulation in the treatment of self-injury. *Journal of Clinical Psychology, 63*(11), 1091–1103. <https://doi.org/10.1002/jclp.20417>
- Gromatsky, M. A., He, S., Perlman, G., Klein, D. N., Kotov, R., & Waszczuk, M. A. (2020). Prospective prediction of first onset of nonsuicidal self-injury in adolescent girls. *Journal of the American Academy of Child and Adolescent Psychiatry, 59*(9), 1049–1057. <https://doi.org/10.1016/j.jaac.2019.08.006>

- Hamaker, E. L., Asparouhov, T., Brose, A., Schmiedek, F., & Muthén, B. (2018). At the frontiers of modeling intensive longitudinal data: Dynamic structural equation models for the affective measurements from the COGITO Study. *Multivariate Behavioral Research*, *53*(6), 820–841. <https://doi.org/10.1080/00273171.2018.1446819>
- Hamza, C. A., Willoughby, T., & Armiento, J. (2014). A laboratory examination of pain threshold and tolerance among nonsuicidal self-injurers with and without self-punishing motivations. *Archives of Scientific Psychology*, *2*(1), 33–42. <http://dx.doi.org/10.1037/arc0000008>
- Hasking, P., Boyes, M. E., Finlay-Jones, A., McEvoy, P. M., & Rees, C. S. (2019). Common pathways to NSSI and suicide ideation: The roles of rumination and self-compassion. *Archives of Suicide Research*, *23*(2), 247–260. <https://doi.org/10.1080/13811118.2018.1468836>
- Hepp, J., Carpenter, R. W., Störkel, L. M., Schmitz, S. E., Schmahl, C., & Niedtfeld, I. (2020). A systematic review of daily life studies on non-suicidal self-injury based on the four-function model. *Clinical Psychology Review*, *82*, 101888. <https://doi.org/10.1016/j.cpr.2020.101888>
- Hepp, J., Carpenter, R. W., Vebares, T. J., & Trull, T. J. (2021). The environmental, interpersonal, and affective context of nonsuicidal self-injury urges in daily life. *Personality Disorders: Theory, Research, and Treatment*, *12*(1), 29–38. <http://dx.doi.org/kuleuven.ezproxy.kuleuven.be/10.1037/per0000456>
- Heron, K. E., & Smyth, J. M. (2010). Ecological momentary interventions: Incorporating mobile technology into psychosocial and health behaviour treatments. *British Journal of Health Psychology*, *15*(1), 1–39. <https://doi.org/10.1348/135910709X466063>
- Hoff, E. R., & Muehlenkamp, J. J. (2009). Nonsuicidal self-injury in college students: The role of perfectionism and rumination. *Suicide & Life-Threatening Behavior*, *39*(6), 576–587. <https://doi.org/10.1521/suli.2009.39.6.576>
- 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>
- Hooley, J. M., Ho, D. T., Slater, J., & Lockshin, A. (2010). Pain perception and nonsuicidal self-injury: A laboratory investigation. *Personality Disorders*, *1*(3), 170–179. <https://doi.org/10.1037/a0020106>
- Hooley, J. M., & St. Germain, S. A. (2014). Nonsuicidal self-injury, pain, and self-criticism: Does changing self-worth change pain endurance in people who engage in self-injury?

- Clinical Psychological Science*, 2(3), 297–305.
<https://doi.org/10.1177/2167702613509372>
- Hughes, C. D., King, A. M., Kranzler, A., Fehling, K., Miller, A., Lindqvist, J., & Selby, E. A. (2019). Anxious and overwhelming affects and repetitive negative thinking as ecological predictors of self-injurious thoughts and behaviors. *Cognitive Therapy and Research*, 43(1), 88–101.
<http://dx.doi.org.kuleuven.ezproxy.kuleuven.be/10.1007/s10608-019-09996-9>
- Humber, N., Emsley, R., Pratt, D., & Tarrier, N. (2013). Anger as a predictor of psychological distress and self-harm ideation in inmates: A structured self-assessment diary study. *Psychiatry Research*, 210(1), 166–173. <https://doi.org/10.1016/j.psychres.2013.02.011>
- International Society for the Study of Self-injury. (2018). What is self-injury? Available from: <https://itriples.org/about-self-injury/what-is-self-injury>.
- Joiner, T. E., Ribeiro, J. D., & Silva, C. (2012). Nonsuicidal self-injury, suicidal behavior, and their co-occurrence as viewed through the lens of the interpersonal theory of suicide. *Current Directions in Psychological Science*, 21(5), 342–347.
<https://doi.org/10.1177/0963721412454873>
- Jose, P. E., & Weir, K. F. (2013). How is anxiety involved in the longitudinal relationship between brooding rumination and depressive symptoms in adolescents? *Journal of Youth and Adolescence*, 42(8), 1210–1222. <https://doi.org/10.1007/s10964-012-9891-3>
- Kaurin, A., Dombrovski, A. Y., Hallquist, M. N., & Wright, A. G. C. (2022). Integrating a functional view on suicide risk into idiographic statistical models. *Behaviour Research and Therapy*, 150, 104012. <https://doi.org/10.1016/j.brat.2021.104012>
- Kessler, R. C., Borges, G., & Walters, E. E. (1999). Prevalence of and risk factors for lifetime suicide attempts in the National Comorbidity Survey. *Archives of General Psychiatry*, 56(7), 617–626. Scopus. <https://doi.org/10.1001/archpsyc.56.7.617>
- Kiekens, G., Claes, L., Demyttenaere, K., Auerbach, R., Green, J., Kessler, R., Mortier, P., Nock, M., & Bruffaerts, R. (2016). Lifetime and 12-month nonsuicidal self-injury and academic performance in college freshmen. *Suicide and Life-Threatening Behavior*, 46(5), 563–576. <https://doi.org/10.1111/sltb.12237>
- Kiekens, G., Hasking, P., Boyes, M., Claes, L., Mortier, P., Auerbach, R. P., Cuijpers, P., Demyttenaere, K., Green, J. G., Kessler, R. C., Myin-Germeys, I., Nock, M. K., & Bruffaerts, R. (2018). The associations between non-suicidal self-injury and first onset suicidal thoughts and behaviors. *Journal of Affective Disorders*, 239, 171–179.
<https://doi.org/10.1016/j.jad.2018.06.033>

- Kiekens, G., Hasking, P., Claes, L., Boyes, M., Mortier, P., Auerbach, R. P., Cuijpers, P., Demyttenaere, K., Green, J. G., Kessler, R. C., Myin-Germeys, I., Nock, M. K., & Bruffaerts, R. (2019). Predicting the incidence of non-suicidal self-injury in college students. *European Psychiatry: The Journal of the Association of European Psychiatrists*, *59*, 44–51. <https://doi.org/10.1016/j.eurpsy.2019.04.002>
- Kiekens, G., Hasking, P., Claes, L., Mortier, P., Auerbach, R. P., Boyes, M., Cuijpers, P., Demyttenaere, K., Green, J. G., Kessler, R. C., Nock, M. K., & Bruffaerts, R. (2018). The DSM-5 nonsuicidal self-injury disorder among incoming college students: Prevalence and associations with 12-month mental disorders and suicidal thoughts and behaviors. *Depression and Anxiety*, *35*(7), 629–637. <https://doi.org/10.1002/da.22754>
- 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*, 214. <https://doi.org/10.3389/fpsy.2020.00214>
- Kiekens, G., Robinson, K., Tatnell, R., & Kirtley, O., (2021). Opening the 'Black Box' of daily life in non-suicidal self-injury research: With great opportunity comes great responsibility. *JMIR Mental Health*, *8*(11), e30915. <http://dx.doi.org/10.2196/30915>.
- Kim, J., & Cicchetti, D. (2010). Longitudinal pathways linking child maltreatment, emotion regulation, peer relations, and psychopathology. *Journal of Child Psychology and Psychiatry*, *51*(6), 706–716. <https://doi.org/10.1111/j.1469-7610.2009.02202.x>
- Kleiman, E. M., & Nock, M. K. (2018). Real-time assessment of suicidal thoughts and behaviors. *Current Opinion in Psychology*, *22*, 33–37. <https://doi.org/10.1016/j.copsyc.2017.07.026>
- Kleiman, E. M., Turner, B. J., Fedor, S., Beale, E. E., Huffman, J. C., & Nock, M. K. (2017). Examination of real-time fluctuations in suicidal ideation and its risk factors: Results from two ecological momentary assessment studies. *Journal of Abnormal Psychology*, *126*(6), 726–738. <https://doi.org/10.1037/abn0000273>
- Kleiman, E. M., Turner, B. J., Fedor, S., Beale, E. E., Picard, R. W., Huffman, J. C., & Nock, M. K. (2018). Digital phenotyping of suicidal thoughts. *Depression and Anxiety*, *35*(7), 601–608. <https://doi.org/10.1002/da.22730>
- Kleiman, E., Millner, A. J., Joyce, V. W., Nash, C. C., Buonopane, R. J., & Nock, M. K. (2019). Using wearable physiological monitors with suicidal adolescent inpatients: Feasibility and acceptability study. *JMIR MHealth and UHealth*, *0*(0), e0. <https://doi.org/10.2196/13725>

- Klonsky, E. D., & May, A. M. (2015). The Three-Step Theory (3ST): A new theory of suicide rooted in the “ideation-to-action” framework. *International Journal of Cognitive Therapy*, 8(2), 114–129. <https://doi.org/10.1521/ijct.2015.8.2.114>
- Klonsky, E. D., & Muehlenkamp, J. J. (2007). Self-injury: A research review for the practitioner. *Journal of Clinical Psychology*, 63(11), 1045–1056. <https://doi.org/10.1002/jclp.20412>
- Kovacs, M., Joormann, J., & Gotlib, I. H. (2008). Emotion (dys)regulation and links to depressive disorders. *Child Development Perspectives*, 2(3), 149–155. <https://doi.org/10.1111/j.1750-8606.2008.00057.x>
- Kraemer, H. C., Kazdin, A. E., Offord, D. R., Kessler, R. C., Jensen, P. S., & Kupfer, D. J. (1997). Coming to terms with the terms of risk. *Archives of General Psychiatry*, 54(4), 337–343. <https://doi.org/10.1001/archpsyc.1997.01830160065009>
- Kranzler, A., Fehling, K. B., Lindqvist, J., Brillante, J., Yuan, F., Gao, X., Miller, A. L., & Selby, E. A. (2018). An ecological investigation of the emotional context surrounding nonsuicidal self-injurious thoughts and behaviors in adolescents and young adults. *Suicide & Life-Threatening Behavior*, 48(2), 149–159. <https://doi.org/10.1111/sltb.12373>
- Laye-Gindhu, A., & Schonert-Reichl, K. A. (2005). Nonsuicidal self-harm among community adolescents: Understanding the “whats” and “whys” of self-Harm. *Journal of Youth and Adolescence*, 34(5), 447–457. <https://doi.org/10.1007/s10964-005-7262-z>
- Lear, M. K., Wilkowski, B. M., & Pepper, C. M. (2019). A daily diary investigation of the defective self model among college students with recent self-injury. *Behavior Therapy*, 50(5), 1002–1012. <https://doi.org/10.1016/j.beth.2019.03.005>
- Lewis, S. P., & Hasking, P. A. (2021). Self-injury recovery: A person-centered framework. *Journal of Clinical Psychology*, 77(4), 884–895. <https://doi.org/10.1002/jclp.23094>
- Löw, C. A., Schauenburg, H., & Dinger, U. (2020). Self-criticism and psychotherapy outcome: A systematic review and meta-analysis. *Clinical Psychology Review*, 75, 101808. <https://doi.org/10.1016/j.cpr.2019.101808>
- May, A. M., & Klonsky, E. D. (2016). What distinguishes suicide attempters from suicide ideators? A meta-analysis of potential factors. *Clinical Psychology: Science and Practice*, 23(1), 5–20. <http://dx.doi.org.kuleuven.ezproxy.kuleuven.be/10.1037/h0101735>

- 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>
- Mestdagh, M., Verdonck, S., Piot, M., Niemeijer, K., Tuerlinckx, F., Kuppens, P., & Dejonckheere, E. (2022). *m-Path: An easy-to-use and flexible platform for ecological momentary assessment and intervention in behavioral research and clinical practice*. PsyArXiv. <https://doi.org/10.31234/osf.io/uqdfs>
- Moberly, N. J., & Watkins, E. R. (2008). Ruminative self-focus, negative life events, and negative affect. *Behaviour Research and Therapy*, 46(9), 1034–1039. <https://doi.org/10.1016/j.brat.2008.06.004>
- Möwisch, D., Schmiedek, F., Richter, D., & Brose, A. (2019). Capturing affective well-being in daily life with the day reconstruction method: A refined view on positive and negative affect. *Journal of Happiness Studies*, 20(2), 641–663. <https://doi.org/10.1007/s10902-018-9965-3>
- Muehlenkamp, J. J., Claes, L., Havertape, L., & Plener, P. L. (2012). International prevalence of adolescent non-suicidal self-injury and deliberate self-harm. *Child and Adolescent Psychiatry and Mental Health*, 6, 10. <https://doi.org/10.1186/1753-2000-6-10>
- Muehlenkamp, J. J., Engel, S. G., Wadeson, A., Crosby, R. D., Wonderlich, S. A., Simonich, H., & Mitchell, J. E. (2009). Emotional states preceding and following acts of non-suicidal self-injury in bulimia nervosa patients. *Behaviour Research and Therapy*, 47(1), 83–87. <https://doi.org/10.1016/j.brat.2008.10.011>
- Myin-Germeys, I., Kasanova, Z., Vaessen, T., Vachon, H., Kirtley, O., Viechtbauer, W., & Reininghaus, U. (2018). Experience sampling methodology in mental health research: New insights and technical developments. *World Psychiatry*, 17(2), 123–132. <https://doi.org/10.1002/wps.20513>
- Myin-Germeys, I., Klippel, A., Steinhart, H., & Reininghaus, U. (2016). Ecological momentary interventions in psychiatry. *Current Opinion in Psychiatry*, 29(4), 258–263. <https://doi.org/10.1097/YCO.0000000000000255>
- Nicolai, K. A., Wielgus, M. D., & Mezulis, A. (2016). Identifying risk for self-harm: Rumination and negative affectivity in the prospective prediction of nonsuicidal self-injury. *Suicide and Life-Threatening Behavior*, 46(2), 223–233. <https://doi.org/10.1111/sltb.12186>

- Nock, M. K. (2009). Why do people hurt themselves?: New insights into the nature and functions of self-injury. *Current Directions in Psychological Science, 18*(2), 78–83. <https://doi.org/10.1111/j.1467-8721.2009.01613.x>
- Nock, M. K. (2010). Self-injury. *Annual Review of Clinical Psychology, 6*(1), 339–363. <https://doi.org/10.1146/annurev.clinpsy.121208.131258>
- Nock, M. K., Joiner, T. E., Gordon, K. H., Lloyd-Richardson, E., & Prinstein, M. J. (2006). Non-suicidal self-injury among adolescents: Diagnostic correlates and relation to suicide attempts. *Psychiatry Research, 144*(1), 65–72. <https://doi.org/10.1016/j.psychres.2006.05.010>
- Nock, M. K., & Prinstein, M. J. (2004). A functional approach to the assessment of self-mutilative behavior. *Journal of Consulting and Clinical Psychology, 72*(5), 885–890. <https://doi.org/10.1037/0022-006X.72.5.885>
- 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>
- Nolen-Hoeksema, S., & Morrow, J. (1991). A prospective study of depression and posttraumatic stress symptoms after a natural disaster: The 1989 Loma Prieta earthquake. *Journal of Personality and Social Psychology, 61*(1), 115–121. <https://doi.org/10.1037/0022-3514.61.1.115>
- Perkins, N. M., Ortiz, S. N., & Smith, A. R. (2020). Self-criticism longitudinally predicts nonsuicidal self-injury in eating disorders. *Eating Disorders, 28*(2), 157–170. <https://doi.org/10.1080/10640266.2019.1695450>
- Piccirillo, M. L., & Rodebaugh, T. L. (2019). Foundations of idiographic methods in psychology and applications for psychotherapy. *Clinical Psychology Review, 71*, 90–100. <https://doi.org/10.1016/j.cpr.2019.01.002>
- Plener, P. L., Libal, G., Keller, F., Fegert, J. M., & Muehlenkamp, J. J. (2009). An international comparison of adolescent non-suicidal self-injury (NSSI) and suicide attempts: Germany and the USA. *Psychological Medicine, 39*(9), 1549–1558. <https://doi.org/10.1017/S0033291708005114>
- Plener, P. L., Schumacher, T. S., Munz, L. M., & Groschwitz, R. C. (2015). The longitudinal course of non-suicidal self-injury and deliberate self-harm: A systematic review of the literature. *Borderline Personality Disorder and Emotion Dysregulation, 2*, 2. <https://doi.org/10.1186/s40479-014-0024-3>

- Regier, D. A., Narrow, W. E., Clarke, D. E., Kraemer, H. C., Kuramoto, S. J., Kuhl, E. A., & Kupfer, D. J. (2013). DSM-5 field trials in the United States and Canada, Part II: Test-retest reliability of selected categorical diagnoses. *The American Journal of Psychiatry*, *170*(1), 59–70. <https://doi.org/10.1176/appi.ajp.2012.12070999>
- Robinson, K., Garisch, J. A., Kingi, T., Brocklesby, M., O'Connell, A., Langlands, R. L., Russell, L., & Wilson, M. S. (2019). Reciprocal risk: The longitudinal relationship between emotion regulation and non-suicidal self-injury in adolescents. *Journal of Abnormal Child Psychology*, *47*(2), 325–332. <https://doi.org/10.1007/s10802-018-0450-6>
- Rodríguez-Blanco, L., Carballo, J. J., & Baca-García, E. (2018). Use of ecological momentary assessment (EMA) in non-suicidal self-injury (NSSI): A systematic review. *Psychiatry Research*, *263*, 212–219. <https://doi.org/10.1016/j.psychres.2018.02.051>
- Russell, J. A. (2003). Core affect and the psychological construction of emotion. *Psychological Review*, *110*(1), 145–172. <https://doi.org/10.1037/0033-295x.110.1.145>
- Russell, M. A., & Gajos, J. M. (2020). Annual research review: Ecological momentary assessment studies in child psychology and psychiatry. *Journal of Child Psychology and Psychiatry*, *61*(3), 376–394. <https://doi.org/10.1111/jcpp.13204>
- Schäfer, J. Ö., Naumann, E., Holmes, E. A., Tuschen-Caffier, B., & Samson, A. C. (2017). Emotion regulation strategies in depressive and anxiety symptoms in youth: A meta-analytic review. *Journal of Youth and Adolescence*, *46*(2), 261–276. <https://doi.org/10.1007/s10964-016-0585-0>
- Schwartz, S. J. (2001). The evolution of Eriksonian and, neo-eriksonian identity theory and research: A review and integration. *Identity*, *1*(1), 7–58. <https://doi.org/10.1207/S1532706XSCHWARTZ>
- Schwartz, S. J., Hardy, S. A., Zamboanga, B. L., Meca, A., Waterman, A. S., Picariello, S., Luyckx, K., Crocetti, E., Kim, S. Y., Brittan, A. S., Roberts, S. E., Whitbourne, S. K., Ritchie, R. A., Brown, E. J., & Forthun, L. F. (2015). Identity in young adulthood: Links with mental health and risky behavior. *Journal of Applied Developmental Psychology*, *36*, 39–52. <https://doi.org/10.1016/j.appdev.2014.10.001>
- Selby, E. A., Anestis, M. D., Bender, T. W., & Joiner Jr., T. E. (2009). An exploration of the emotional cascade model in borderline personality disorder. *Journal of Abnormal Psychology*, *118*(2), 375–387. <https://doi.org/10.1037/a0015711>

- Selby, E. A., Franklin, J., Carson-Wong, A., & Rizvi, S. L. (2013). Emotional cascades and self-injury: Investigating instability of rumination and negative emotion. *Journal of Clinical Psychology, 69*(12), 1213–1227. <https://doi.org/10.1002/jclp.21966>
- Selby, E. A., & Joiner, T. E. (2009). Cascades of emotion: The emergence of borderline personality disorder from emotional and behavioral dysregulation. *Review of General Psychology, 13*(3), 219. <https://doi.org/10.1037/a0015687>
- Selby, E. A., Kondratyuk, S., Lindqvist, J., Fehling, K., & Kranzler, A. (2021). Temporal Bayesian network modeling approach to evaluating the emotional cascade model of borderline personality disorder. *Personality Disorders, 12*(1), 39–50. <https://doi.org/10.1037/per0000398>
- Selby, E. A., Kranzler, A., Fehling, K. B., & Panza, E. (2015). Nonsuicidal self-injury disorder: The path to diagnostic validity and final obstacles. *Clinical Psychology Review, 38*, 79–91. <https://doi.org/10.1016/j.cpr.2015.03.003>
- 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>
- Snir, A., Rafaeli, E., Gadassi, R., Berenson, K., & Downey, G. (2015). Explicit and inferred motives for non-suicidal self injurious acts and urges in borderline and avoidant personality disorders. *Personality Disorders, 6*(3), 267–277. <https://doi.org/10.1037/per0000104>
- St. Germain, S. A., & Hooley, J. M. (2012). Direct and indirect forms of non-suicidal self-injury: Evidence for a distinction. *Psychiatry Research, 197*(1), 78–84. <https://doi.org/10.1016/j.psychres.2011.12.050>
- Stange, J. P., Kleiman, E. M., Mermelstein, R. J., & Trull, T. J. (2019). Using ambulatory assessment to measure dynamic risk processes in affective disorders. *Journal of Affective Disorders, 259*, 325–336. <https://doi.org/10.1016/j.jad.2019.08.060>
- Swannell, S. V., Martin, G. E., Page, A., Hasking, P., & St John, N. J. (2014). Prevalence of nonsuicidal self-injury in nonclinical samples: Systematic review, meta-analysis and meta-regression. *Suicide & Life-Threatening Behavior, 44*(3), 273–303. <https://doi.org/10.1111/sltb.12070>
- Taliaferro, L. A., & Muehlenkamp, J. J. (2015). Risk factors associated with self-injurious behavior among a national sample of undergraduate college students. *Journal of American College Health: J of ACH, 63*(1), 40–48. <https://doi.org/10.1080/07448481.2014.953166>

- Tatnell, R., Hasking, P., Newman, L., Taffe, J., & Martin, G. (2017). Attachment, emotion regulation, childhood abuse and assault: Examining predictors of NSSI among adolescents. *Archives of Suicide Research, 21*(4), 610–620.
<https://doi.org/10.1080/13811118.2016.1246267>
- Tatnell, R., Kelada, L., Hasking, P., & Martin, G. (2014). Longitudinal analysis of adolescent NSSI: The role of intrapersonal and interpersonal factors. *Journal of Abnormal Child Psychology, 42*(6), 885–896. <https://doi.org/10.1007/s10802-013-9837-6>
- 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>
- Thomsen, D. K. (2006). The association between rumination and negative affect: A review. *Cognition and Emotion, 20*(8), 1216–1235.
<https://doi.org/10.1080/02699930500473533>
- Trull, T. J., & Ebner-Priemer, U. (2013). Ambulatory assessment. *Annual Review of Clinical Psychology, 9*, 151–176. <https://doi.org/10.1146/annurev-clinpsy-050212-185510>
- Turner, B. J., Baglole, J. S., Chapman, A. L., & Gratz, K. L. (2018). Experiencing and resisting nonsuicidal self-injury thoughts and urges in everyday life. *Suicide & Life-Threatening Behavior, 49*(5), 1332–1346. <https://doi.org/10.1111/sltb.12510>
- Turner, B. J., Cobb, R. J., Gratz, K. L., & Chapman, A. L. (2016). The role of interpersonal conflict and perceived social support in nonsuicidal self-injury in daily life. *Journal of Abnormal Psychology, 125*(4), 588–598. <https://doi.org/10.1037/abn0000141>
- Turner, B. J., Jin, H. M., Anestis, M. D., Dixon-Gordon, K. L., & Gratz, K. L. (2018). Personality pathology and intentional self-harm: Cross-cutting insights from categorical and dimensional models. *Current Opinion in Psychology, 21*, 55–59.
<https://doi.org/10.1016/j.copsyc.2017.09.009>
- Turner, B. J., Layden, B. K., Butler, S. M., & Chapman, A. L. (2013). How often, or how many ways: Clarifying the relationship between non-suicidal self-injury and suicidality. *Archives of Suicide Research, 17*(4), 397–415.
<https://doi.org/10.1080/13811118.2013.802660>
- Valencia-Agudo, F., Burcher, G. C., Ezpeleta, L., & Kramer, T. (2018). Nonsuicidal self-injury in community adolescents: A systematic review of prospective predictors, mediators and moderators. *Journal of Adolescence, 65*, 25–38.
<https://doi.org/10.1016/j.adolescence.2018.02.012>

- Van Orden, K. A., Witte, T. K., Cukrowicz, K. C., Braithwaite, S., Selby, E. A., & Joiner, T. E. (2010). The interpersonal theory of suicide. *Psychological review*, *117*(2), 575–600. <https://doi.org/10.1037/a0018697>
- Victor, S. E., Hipwell, A. E., Stepp, S. D., & Scott, L. N. (2019). Parent and peer relationships as longitudinal predictors of adolescent non-suicidal self-injury onset. *Child and Adolescent Psychiatry and Mental Health*, *13*(1), 1. <https://doi.org/10.1186/s13034-018-0261-0>
- Victor, S. E., & Klonsky, E. D. (2014). Correlates of suicide attempts among self-injurers: A meta-analysis. *Clinical Psychology Review*, *34*(4), 282–297. <https://doi.org/10.1016/j.cpr.2014.03.005>
- Victor, S. E., Scott, L. N., Stepp, S. D., & Goldstein, T. R. (2019). I want you to want me: Interpersonal stress and affective experiences as within-person predictors of nonsuicidal self-injury and suicide urges in daily life. *Suicide and Life-Threatening Behavior*, *49*(4), 1157–1177. <https://doi.org/10.1111/sltb.12513>
- Voelkle, M. C., Brose, A., Schmiedek, F., & Lindenberger, U. (2014). Toward a unified framework for the study of between-person and within-person structures: Building a bridge between two research paradigms. *Multivariate Behavioral Research*, *49*(3), 193–213. <https://doi.org/10.1080/00273171.2014.889593>
- Waals, L., Baetens, I., Rober, P., Lewis, S., Van Parys, H., Goethals, E. R., & Whitlock, J. (2018). The NSSI family distress cascade theory. *Child and Adolescent Psychiatry and Mental Health*, *12*, Article 52. <https://doi.org/10.1186/s13034-018-0259-7>
- Wang, L., & Miller, L. C. (2020). Just-in-the-Moment Adaptive Interventions (JITAI): A Meta-Analytical Review. *Health Communication*, *35*(12), 1531–1544. <https://doi.org/10.1080/10410236.2019.1652388>
- Weermeijer, J., Lafit, G., Kiekens, G., Wampers, M., Eisele, G., Kasanova, Z., Vaessen, T., Kuppens, P., & Myin-Germeys, I. (2022). Applying multiverse analysis to experience sampling data: Investigating whether preprocessing choices affect robustness of conclusions. *Behavior Research Methods*. <https://doi.org/10.3758/s13428-021-01777-1>
- Whitlock, J., Eckenrode, J., & Silverman, D. (2006). Self-injurious behaviors in a college population. *Pediatrics*, *117*(6), 1939–1948. <https://doi.org/10.1542/peds.2005-2543>
- Whitlock, J., Muehlenkamp, J., Purington, A., Eckenrode, J., Barreira, P., Baral Abrams, G., Marchell, T., Kress, V., Girard, K., Chin, C., & Knox, K. (2011). Nonsuicidal self-injury in a college population: General trends and sex differences. *Journal of*

- American College Health: J of ACH*, 59(8), 691–698.
<https://doi.org/10.1080/07448481.2010.529626>
- Wilkinson, P. O., Qiu, T., Neufeld, S., Jones, P. B., & Goodyer, I. M. (2018). Sporadic and recurrent non-suicidal self-injury before age 14 and incident onset of psychiatric disorders by 17 years: Prospective cohort study. *The British Journal of Psychiatry: The Journal of Mental Science*, 212(4), 222–226. <https://doi.org/10.1192/bjp.2017.45>
- Willoughby, T., Heffer, T., & Hamza, C. A. (2015). The link between nonsuicidal self-injury and acquired capability for suicide: A longitudinal study. *Journal of Abnormal Psychology*, 124(4), 1110–1115. <https://doi.org/10.1037/abn0000104>
- Wright, A. G. C. (2011). Qualitative and quantitative distinctions in personality disorder. *Journal of Personality Assessment*, 93(4), 370–379.
<https://doi.org/10.1080/00223891.2011.577477>
- Wright, A. G. C., & Woods, W. C. (2020). Personalized models of psychopathology. *Annual Review of Clinical Psychology*, 16, 49–74. <https://doi.org/10.1146/annurev-clinpsy-102419-125032>
- You, J., Jiang, Y., Zhang, M., Du, C., Lin, M.-P., & Leung, F. (2017). Perceived parental control, self-criticism, and nonsuicidal self-injury among adolescents: Testing the reciprocal relationships by a three-wave cross-lag model. *Archives of Suicide Research*, 21(3), 379–391. <https://doi.org/10.1080/13811118.2016.1199989>
- Zaki, L. F., Coifman, K. G., Rafaeli, E., Berenson, K. R., & Downey, G. (2013). Emotion differentiation as a protective factor against nonsuicidal self-injury in borderline personality disorder. *Behavior Therapy*, 44(3), 529–540.
<https://doi.org/10.1016/j.beth.2013.04.008>
- Zelkowitz, R. L., & Cole, D. A. (2019). Self-criticism as a transdiagnostic process in nonsuicidal self-injury and disordered eating: Systematic review and meta-analysis. *Suicide and Life-Threatening Behavior*, 49(1), 310–327.
<https://doi.org/10.1111/sltb.12436>
- Zelkowitz, R. L., & Cole, D. A. (2020). Longitudinal relations of self-criticism with disordered eating behaviors and nonsuicidal self-injury. *International Journal of Eating Disorders*, 53(7), 1097–1107. <https://doi.org/10.1002/eat.23284>
- Zetterqvist, M. (2015). The DSM-5 diagnosis of nonsuicidal self-injury disorder: A review of the empirical literature. *Child and Adolescent Psychiatry and Mental Health*, 9(1), 31.
<https://doi.org/10.1186/s13034-015-0062-7>

