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Review

A systematic review of interpersonal processes and their measurement within experience sampling studies of self-injurious thoughts and behaviours

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ABSTRACT

Self-injurious thoughts and behaviours (SITBs) are a leading cause of death, and interpersonal processes (IPs) appear to play a role in SITBs. This systematic review synthesises the literature on IPs and SITBs in daily life and addresses four critical questions: (1) Which IPs have been assessed and how, (2) How are differences in IPs *between* individuals associated with SITBs?, (3) How are differences in IPs *within* individuals associated with SITBs? and (4) Do IPs relate differently to self-injurious thoughts than behaviours? Our review followed PRISMA guidelines and eligible literature was screened until 25 April 2024. We identified 58 Experience Sampling studies (32.76% daily-diary studies) of which most focused on IPs from major SITBs theories (e.g., thwarted belongingness) but largely used inconsistent operationalizations. Results from 39 studies investigating within-person associations were mixed. Based on 26 studies, whether differences in IPs between individuals relate to SITBs remains unclear. Three studies have investigated whether IPs relate to the transition from thoughts to behaviours, but temporal models are needed to draw firm conclusions. Studies investigating IPs and SITBs in daily life are largely inconclusive. Psychometrically validated measures are warranted, and future daily-life studies would benefit from drawing on ideation-to-action frameworks.

1. Introduction

Self-injurious thoughts and behaviours (SITBs) are a leading cause of death worldwide and refer to any thought or act of self-injury of an individual.[1] >700,000 people die by suicide every year (World Health Organization, 2019) and the number of individuals who think about attempting suicide and make a (non-fatal) suicide attempt is even greater (Mortier et al., 2018; Nock, Borges, Bromet, Cha, et al., 2008), with lifetime prevalence rates in adolescents in the 12.1–18.0%, 4.0–9.9%, 4.1–6.0% range for suicidal thoughts, plans, and attempts, respectively (Lim et al., 2019; Nock et al., 2013; Nock, Borges, Bromet, Cha, et al., 2008). These prevalence rates are 22.3%, 6.1%, and 3.2% for emerging adults (Mortier et al., 2018) and 9.2%, 3.1%, and 2.7% for adults (Nock, Borges, Bromet, Alonso, et al., 2008). Among adolescents and emerging adults, non-suicidal self-injury (NSSI) is also a significant public health issue. The lifetime prevalence rate of NSSI is estimated between 16.9 and 22.1% (Gillies et al., 2018; Lim et al., 2019; Muehlenkamp et al., 2012; Swannell et al., 2014; Voss et al., 2020) for adolescents and 13.4–22.8% for emerging adults (Kiekens et al., 2023; Sivertsen et al., 2019; Swannell et al., 2014). These findings and the strong association between NSSI and suicidal thoughts and behaviours (Hamza et al., 2012; Kiekens et al., 2018; Ribeiro et al., 2016) highlight the importance of investigating risk and protective factors for SITBs together to identify *who* is at risk (i.e., between-person level), *when* momentary risk of SITBs increases among individuals who report SITBs (i.e., within-person level), and whether there are differences between

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[1] The term SITBs is used to refer to self-injurious thoughts and behaviours, irrespective of suicidal intent. However, when authors have referred to specific behaviours, using specific terminology, we have also used these terms.

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non-suicidal and suicidal forms of self-injury.

Interpersonal processes (IPs), defined as 'the interplay of cognitive, motivational, and behavioural activities in social interaction' (Snyder & Stukas Jr, 1999), have been associated with SITBs for decades (Peel-Wainwright et al., 2021; Van Orden et al., 2010). There are currently three major ideation-to-action models of suicidal behaviour: the Interpersonal Psychological Theory (IPT; Joiner, 2005; Van Orden et al., 2012), the Three-Step Theory (3ST; Klonsky & May, 2015), and the Integrated Motivational-Volitional model (IMV; O'Connor, 2011; O'Connor & Kirtley, 2018). All three of these ideation-to-action models make a distinction between the emergence of suicidal thoughts and the subsequent transition to behaviour. In these models, it is proposed that the emergence and risk of transitioning from suicidal thoughts to behaviour are determined by IPs. For example, based on the IPT, the IMV model features the interaction of thwarted belongingness and perceived burdensomeness as a moderator in the emergence of suicidal ideation. In addition, theoretical models of NSSI also highlight the importance of IPs. For example, the Four-Function Model of NSSI (Bentley et al., 2014) indicates that individuals may engage in NSSI to decrease interpersonal demands, as well as to generate attention and support (Bentley et al., 2014), with meta-analytic evidence showing 44% of individuals report engaging in NSSI for interpersonal reasons (Taylor et al., 2018). The Benefits and Barriers Model (Hooley & Franklin, 2017) proposes that communication and affiliation benefits play an important role in the emergence of NSSI. Most recently, the NSSI Family Distress Cascade Theory (Waals et al., 2018) conceptualizes the impact of NSSI at the family level as an interpersonal interaction and complementary escalation between the caregivers and the individual who self-injures (Watzlawick et al., 1974). Importantly, however, none of these models explicitly differentiate between NSSI thoughts and the transition to NSSI behaviour.

Three IPs that are common across most theoretical models and have been studied extensively are social connectedness, thwarted belongingness and perceived burdensomeness. Social connectedness is a broad term, defined as one's subjective sense of connection to the world, including close others, strangers and the community (Lee & Robbins, 1995; Seppala et al., 2013). Social rejection, social support and attachment are related constructs to social connectedness (Joiner, 2005; Klonsky & May, 2015; O'Connor & Kirtley, 2018), and belongingness is a construct intertwined with social connectedness. Existing literature sometimes characterises social connectedness as an aspect of belongingness (Lee & Robbins, 1995), whereas others consider it a separate but related construct (Seppala et al., 2013). Within the IPT, thwarted belongingness is a state in which the fundamental "need to belong" (Baumeister & Leary, 1995, p. 1) is unmet, conceptualized as a multidimensional construct with two main aspects: loneliness and the absence of reciprocally caring relationships (Van Orden et al., 2010). Perceived burdensomeness is defined as a mental state in which an individual perceives that close others would be better off without them, and is also defined as a multidimensional construct involving liability and self-hate (Van Orden et al., 2010).

In the literature, other IPs such as social interactions (Brown & Plener, 2017; Conwell et al., 2002) and loneliness (Calati et al., 2019) have also been studied separately in the context of SITBs. For example, Calati et al. (2019) reviewed 40 observational studies and concluded that social isolation and loneliness were associated with suicidal outcomes. In addition, interpersonal problems, e.g., conflicts (Stepp et al., 2008), and experiences, e.g., rejection (Cawley et al., 2019), were previously related to suicide-related behaviours, i.e., self-harm and attempt. A final IP that raises concern is the encouragement of others to engage in self-injurious behaviours (Dyson et al., 2016). However, the specific role of these IPs in SITBs remains unclear (McClelland et al., 2020; Stewart et al., 2017).

Several studies have investigated associations between IPs and SITBs (e.g., Assavedo & Anestis, 2016; Brailovskaia, Teismann, & Margraf, 2020; Venta et al., 2014), and mostly relied on cross-sectional and traditional prospective surveys, retrospectively assessing IPs and SITBs at a single or handful time points throughout development. Whilst such studies provided insights into the general and longer-term between-person relationships between IPs and SITBs, recent research has shown that IPs and SITBs are both *dynamic* constructs that fluctuate in the short-term within individuals with a history of SITBs (Czyz, Glenn, et al., 2019; Kaurin et al., 2022). Therefore, it is necessary to move beyond retrospective assessment methods, as this allows for capturing between and within-person differences, reduces recall bias (Esposito et al., 2022; Gratch et al., 2021), and increases ecological validity (Sedano-Capdevila et al., 2021). Disentangling between and within-person associations is critical to determine whether IPs can help clarify *who* is most at risk and *when* individuals' risk of SITBs is increased in daily life. One approach to this is to use the experience sampling method (ESM), also referred to as ecological momentary assessment (EMA), where participants complete brief assessments over days or weeks in their natural environment on a mobile or wearable device (Csikszentmihalyi & Larson, 1987; Myin-Germeys et al., 2018; Stone & Shiffman, 1994). Daily diaries are a particular case of ESM studies in which assessments occur only once daily, typically at the end of the day.

The scientific advantages of using ESM to investigate IPs (Hermans et al., 2019) and SITBs (Kiekens et al., 2021; Kleiman & Nock, 2018) are manifold, and ESM studies of SITBs have already delivered valuable new insights, for example, by revealing different profiles of suicidal ideation (Kleiman et al., 2018). Given these advantages, it is no surprise that ESM studies on SITBs are burgeoning as we move into a digital era. While past reviews have focused on momentary factors related to SITBs (Ammerman & Law, 2022; Gee et al., 2020; Hepp et al., 2020; Rodriguez-Blanco et al., 2018; Sedano-Capdevila et al., 2021), none of these specifically considered the role of IPs, with some focusing on only specific outcomes: suicidal ideation (Ammerman & Law, 2022), functions of NSSI (Hepp et al., 2020), and a broader range of (mostly intrapersonal) factors (Rodriguez-Blanco et al., 2018). In addition, these previous reviews have also not discussed measurement and timescale issues, leaving critical questions unanswered— how can we measure IPs and SITBs in daily life? Over what timescales do relationships between IPs and SITBs exist? Therefore, a comprehensive review focusing specifically on the role of IPs and how they have been investigated in ESM studies is timely to synthesise findings and reduce fragmentation of a rapidly growing literature.[2] In the following section, we outline three areas in ESM research on IPs and SITBs where synthesis is required to fill key knowledge gaps and help move the field forward.

1.1. Characterisation and measurement of IPs and SITBs in daily life

ESM research is a field replete with complexity and methodological challenges that have rarely been substantively examined in previous studies or reviews within the SITB literature. While several ESM studies (e.g., Hallensleben et al., 2019; Parrish et al., 2021) have focused on the relationship between SITBs and thwarted belongingness and burdensomeness from the IPT (Joiner, 2005; Van Orden et al., 2012), it is clear from the broader ESM literature that this approach offers the potential to capture a much broader array of IPs in daily life that are of relevance to SITBs (e.g., Coppersmith et al., 2019; Glenn et al., 2022). To build a cumulative science of IPs in the context of SITBs, it is relevant to create a systematic overview of the range of IPs that have been investigated in ESM studies, and the extent to which the evidence for the relationship between particular IPs and SITBs converges or diverges.

The added value of ESM for capturing behaviours, feelings, and experiences in daily life is in large part predicated on our ability to accurately measure the constructs of interest. However, in ESM research where questionnaires are kept necessarily short to reduce participant

[2] Only nineteen studies (36.5%) of the complete set of studies in the present review were mentioned in other reviews (see supplementary file 3).

burden, single-item, unvalidated measures of constructs are common (Horstmann & Ziegler, 2020; Wright & Zimmermann, 2019). Discussions around measurement issues in ESM (Kirtley et al., 2021; Mestdagh & Dejonckheere, 2021) are unfolding against the backdrop of the replication crisis in psychological science (Shrout & Rodgers, 2018), and therefore a thorough investigation of the methods used to assess IPs in ESM studies on SITBs is warranted to tackle potential threats to validity in this literature.

1.2. Deconstructing the nature of the short-term relationship between IPs and SITBs

To understand when an individual is at risk for SITBs and to facilitate prevention and intervention in daily life, it is critical to clarify how IPs are contemporaneously and temporally associated with SITBs. Determining on what time scale risk and protective factors relate to SITBs is a critical (Coppersmith et al., 2023), yet neglected, consideration theoretical models that differentiate between the emergence of self-injurious thoughts and the potential transition to behaviour. Based on cross-sectional studies using retrospective self-report surveys (Chu et al., 2017; Van Orden et al., 2006), we may expect associations between thwarted belongingness, perceived burdensomeness and suicidal ideation in daily life. Our review, therefore, seeks to clarify the timescales (minutes, hours, days) over which IPs are — if at all — associated with SITBs, which is an essential step in the pathway toward real-time interventions for SITBs (Coppersmith et al., 2023; Kiekens et al., 2021).

Alongside the question of temporality is the level at which the relationship between IPs and SITBs plays out, which is a question that ESM is uniquely placed to answer. ESM can clarify between-person differences in IPs, for example, whether mean levels of daily-life belongingness differ between individuals who do or do not engage in SITBs, and within-person differences, such as whether belongingness is more strongly associated with SITBs for some individuals than others. Further, current reviews of ESM studies investigating within-person associations between risk/protective factors and SITBs have mainly focused on affective states and SITBs in daily life (Hepp et al., 2020; Rodriguez-Blanco et al., 2018; Sedano-Capdevila et al., 2021), but relationships between SITBs and IPs have not received equal attention. Therefore, our review aims to provide a comprehensive overview of the relationships between IPs and SITBs in daily life considering both between- and within-person associations.

1.3. Understanding within-person variability in IPs and how this relates to the presence of SITBs

Current theoretical models and research on SITBs fall short of explaining within-person variability in IPs among individuals with a history of SITBs, while research from other domains has shown the dynamic nature of IPs. Better understanding the degree to which IPs vary within individuals who report SITBs (e.g., individual variation in momentary levels of social connectedness, thwarted belongingness and perceived burdensomeness) and how this differs between people who do and do not engage in SITBs and/or between subgroups of individuals who engage in SITBs would be theoretically and clinically relevant. Moreover, understanding to what extent within-person variability in IPs relates to within-person variability in SITBs may strengthen our knowledge about the development of acute SITB risk. Between-person differences in (within-person) variability was illustrated in seminal work by Kleiman et al. (2018), who identified distinct profiles of suicidal ideation based on mean levels and within-person variability. Some individuals appear to experience highly variable levels of suicidal ideation over time, whereas others experience more stable high or low levels of suicidal ideation (Kleiman et al., 2018). As we can expect meaningful differences in individuals' experiences of both IPs *and* SITBs (Czyz, Horwitz, et al., 2019; Kaurin et al., 2022), studies could also provide insights into how dynamic profiles (digital phenotypes) of IPs and SITBs are related among people who engage in SITBs. Existing ESM research encompasses a range of SITBs beyond suicidal ideation, but the extent to which such profiles may be observed in other types of SITBs, such as NSSI thoughts or urges, and how this relates to potential profiles that characterize how IPs are experienced is unknown. Such information would provide meaningful information to researchers and clinicians.

1.4. The current review

To address these knowledge gaps, our systematic review aims to answer four research questions:

1. Which IPs have been assessed in ESM studies of SITBs and how have they been assessed?
2. **How are differences in IPs *between* individuals associated with SITBs? (i.e., *who* is at risk for SITBs?)**
3. How are differences in IPs *within* individuals associated with SITBs? (i.e., *when* is momentary risk increased among individuals?)
4. Do IPs in daily life differentially relate to self-injurious thoughts rather than behaviours?

2. Method

2.1. Open science practices

The protocol for our systematic review was pre-registered on PROSPERO [CRD42021267009] using the NIRO-SR template (Topor et al., 2022). We report our findings according to the PRISMA 2020 statement on preferred reporting items for systematic reviews and meta-analyses (Page et al., 2021). All study materials, including the full search syntax, data extraction forms, and quality assessment tools, can be found on the Open Science Framework (OSF): https://osf.io/dxvsh/.

2.2. Search strategy

Embase, Medline, Web of Science, Proquest Psychology, and the OSF Preprints databases were searched on July 21, 2021. The databases were searched on three domains: 'suicide', 'non-suicidal self-injury' and the 'experience sampling method'. To ensure completeness within our search, IPs were not added to the search query. Instead, we applied this criterion during the screening of the articles. The final updated search was on 25th of April 2024. On the suggestion of a subject librarian at the time, we used Europe PMC instead of OSF Preprints to search for preprints, as this database is more user-friendly, and allows exportation, increasing reproducibility. All deviations from the registered protocol and the search strategies for each database are documented and can be found on the OSF page in the supplementary files: https://osf.io/dxvsh/.

2.3. Selection criteria

Studies were included if they: (1) examined non-suicidal or suicidal self-injurious thoughts/urges and behaviours; (2) investigated the association between IPs and SITBs in daily life; (3) made use of an intensive longitudinal method, i.e. ESM, EMA, Ambulatory Assessment (AA) or daily diary; (4) in any of the following study designs: cross-sectional, case-control, longitudinal or prospective study. Studies were included irrespective of participants' age, sex, and history of psychiatric disorder, and the year and language of publication. Studies were excluded if they did not specifically investigate the association between IPs and SITBs in daily life (e.g., studies investigating functions of NSSI). Given that investigating the methodological approaches used in ESM studies of IPs and SITBs was one of our research questions, studies were included regardless of their methodological quality.

See Fig. 1 for the PRISMA flow diagram (Haddaway et al., 2022) of the search. One additional paper, co-authored by GK, was subsequently added to the review as despite being indexed in databases during the

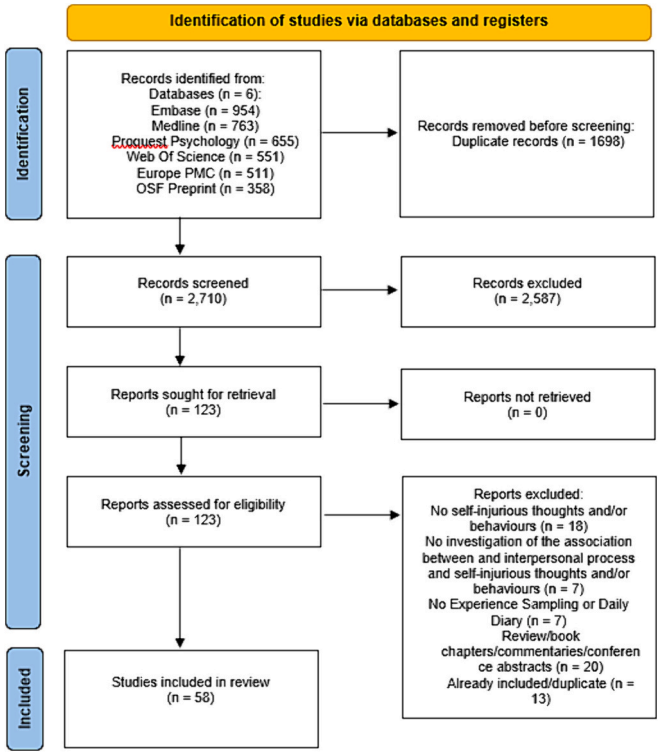

Fig. 1. PRISMA flow diagram of the search.

period covered by our updated search, this paper was not returned by the search terms.

2.4. Data extraction

Two reviewers (MJ and JJJ) extracted data from 58 selected studies. A third reviewer (OJK) checked a 25% random subsample of the data for consistency and clarity. Data extracted were study characteristics, demographic and clinical descriptions of the sample, and characteristics of SITBs. As main outcomes, we extracted: (1) the description of IPs studied; (2) a description of the results, including the association between IPs and SITBs; and (3) the assessment of IPs, including ESM item characteristics.

2.5. Critical appraisal

A composite reporting quality assessment tool for ESM studies, adapted from Liao et al. (2016) and Trull and Ebner-Priemer (2020), was developed, as no specific tool exists to assess quality or risk of bias in ESM studies. Our composite quality assessment tool is available at https://osf.io/dxvsh/.

One reviewer (JJJ) assessed each record's methodological and reporting quality. Uncertainties were resolved by the senior author (OJK). Unpublished preprint literature was also included in our search. However, given that OSF Preprints has no export function, we changed our protocol and used Europe PMC for our updated search (see transparent changes document: https://osf.io/dxvsh/).

2.6. Synthesis

We produced a narrative synthesis because of the heterogeneity of methods and populations. MJ and JJJ synthesized the results, supervised by OJK and GK.

3. Results

3.1. Search results and sample characteristics

The complete search produced 4408 records, of which 1698 were duplicates. This resulted in the inclusion of 58 studies in this review (Fig. 1).

Table 1 describes the sample and ESM characteristics of each study. Studies were conducted in the USA ($n = 36$), Canada ($n = 6$), Germany (n = 6), France ($n = 1$), Belgium ($n = 4$), Korea (n = 1), Australia (n = 1) and North America and Europe combined (n = 1). Two studies did not report where they were conducted. Studies used 49 unique samples ranging from 16 to 1780 participants (mean age between 13.6 and 47.7 years). Overall, participants were predominantly female and White/Caucasian (11 studies did not report participants' ethnicity/race). Samples were recruited in community ($n = 28$), clinical ($n = 21$), and a combination of community and clinical settings ($n = 8$). One study did not report the recruitment setting. Seventeen studies were adolescent samples (10–18 years), 14 studies sampled emerging adults (18–29 years), 15 studies were conducted in adult samples (30+ years old), and 11 studies used a combined sample. Thirty-five studies reported their participants' lifetime prevalence rate of SITBs, ranging from 29.2% to 100% for NSSI and from 0% to 100% for a history of suicide attempts. Thirty-three studies also measured the recency of SITBs at baseline, which ranged from the previous 24 h to the past year.

Of the 58 included studies, 77.59% ($n = 45$) measured SITBs and 82.8% ($n = 48$) IPs with ESM, with x% ($n = 38$) assessing both constructs in daily life. All studies had one ESM data collection period, ranging from 2 days up to 8 weeks. Most studies (n = 28) used a signal-contingent sampling strategy, followed by interval-based sampling ($n = 20$) and event-contingent sampling ($n = 2$). Eight studies combined different sampling strategies. The sampling density ranged from 1 in daily diary studies ($n = 19$) to 12 daily assessments. Most studies used smartphones ($n = 40$) or palmtop computers (n = 6) to send notifications, while eight studies did not use a dedicated device and either sent a link and a password for an online questionnaire via e-mail. Compliance ranged from 31% to 92% across studies, with 16 studies not reporting compliance rates.

3.2. Quality assessment

Table 2 presents the reporting quality across all ESM studies (see supplementary Table 1 for an overview of individual studies). While most studies provided some rationale for using ESM ($n = 55$, 94.8%) and described information regarding procedures to enhance compliance ($n = 49$, 84.5%) and the technology used ($n = 47$, 81.0%), few studies reported information on crucial methodological aspects of their ESM protocol, such as the sampling design ($n = 11$, 19.0%) and density (n = 19, 32.8%), and sample size ($n = 12$, 20.7%). In addition, few studies (n = 28, 48.28%) reported descriptive information regarding valid data (e.g., mean per person, range, participants above and below 80% threshold) or design features that addressed potential bias or burden (e.g., item-randomization to reduce participant burden; n = 11, 19.0%). Similarly, most studies did not comply or only partially complied with the reporting quality criteria for the results. For instance, few studies reported the response latency ($n = 8$, 13.8%), and whether missing data were related to participant characteristics ($n = 10$, 17.2%). Also, only four studies included in this review pre- or post-registered their hypotheses, research questions, analysis plan, or methods, and only fifteen studies (25.86%) have made their data or materials publicly available.

1. **Which IPs have been assessed in ESM studies of SITBs and how have they been assessed?**

Interpersonal constructs. Eighteen studies investigated primary IPs from contemporary models of SITBs: connectedness, including peer,

Table 1
Sample and ESM characteristics.

Reference, Country	Developmental Stage of Sample and Setting	Mean Age (SD)	Female (%)	n	ESM Methodology (Duration, Sampling Frequency, Density, Mode of Assessment, Mean/ Median Compliance)	ESM Variables	Baseline Variables
Al-Dajani and Czyz (2022) USA	Adolescents recruited in a clinical setting (inpatients)	15.19 (1.35)	67.9	78	28 days of interval (1/day) sampling via smartphone (*compliance* = 72.36%)	Suicidal urge intensity PB Peer belongingness Family belongingness	PB TB
Al-Dajani et al. (2022) USA	Adolescents recruited in a clinical setting (inpatients)	15.19 (1.35)	69	78	28 days of interval (1/day) sampling via smarthphone (*compliance* = 72.4%)	Suicidal urge intensity Reaching out to personal and professional support	SI severity SB
Ammerman and Jacobucci (2023) USA	Adults recruited in a community setting	25.88 (5.84)	62.9	35	30 days of signal (4/day) sampling via smartphone (*compliance* = 60.6%)	Social contact Passive SI Active SI Social interaction quality Social interaction quantity Social conflict	N/A
Berghoff et al. (2022) USA	Emerging adults recruited in a community setting	20.35 (2.97)	77.7	103	14 days of interval (1/day) sampling via e-mail (*compliance* = not reported)	NSSI behaviour Interpersonal experiences	NSSI frequency NSSI duration NSSI severity
Botelho et al. (2023) USA	Adults recruited in a community setting	28.63 (1162)	34.2	38	30 days of interval (1/day) sampling via e-mail (*compliance* = 73%)	Discrimination/rejection Acquired capability for suicide Violence	N/A
Brown et al. (2023) USA	Adults recruited in a community setting	34.32 (15.12)	81.0	211	14 days of interval (1/day) sampling via smartphone (*compliance* = not reported)	Social support seeking Barriers to seeking support Loneliness Unfavourable social comparisons	SI severity
Christensen et al. (2023) USA	Emerging adults in a community setting	23.52 (4.26)	55.9	93	14 days of signal (6/day) sampling via smartphone (*compliance* = 75.5%)	Interpersonal experiences, e.g., social support NSSI urges/thoughts NSSI behaviours Suicidal thoughts Suicidal behaviours	Social support
Coppersmith et al. (2019) USA	Emerging adults recruited in a community setting	23.52 (4.31)	77.1	53	28 days of interval (1/day) sampling via smartphone (*compliance* = not reported)	SI Social support TB PB	N/A
Czyz, Horwitz, et al. (2019) USA	Adolescents recruited in a clinical setting (inpatients)	15.5 (1.35)	76.5	34	28 days of interval (1/day) sampling via smartphone (*compliance* = 69.4%)	Connectedness Burdensomeness SI SI urge intensity SI frequency and duration	SI severity
Czyz, Glenn, et al. (2019) USA	Adolescents recruited in a clinical setting (inpatients)	15.5 (1.35)	76.5	34	28 days of interval (1/day) sampling via smartphone (*compliance* = 69.4%)	SI NSSI behaviours Coping behaviour (e.g., relying on support from others)	NSSI history SB
Czyz et al. (2021) USA	Adolescents recruited in a clinical setting	15.4 (1.37)	75	32	Two weeks of interval (1/day) sampling via smartphone (*compliance* = 76.3%)	Connectedness Burdensomeness SI duration	Occurrence of a suicidal crisis
Defayette et al. (2023) USA	Emerging adults recruited in community setting	19.55 (1.29)	83.3	42	28 days of signal (6/day) sampling via smartphone (*compliance* = 71.84%)	Negative peer events Feelings of exclusion SI and SB	N/A
Depp et al. (2016) USA	Adults recruited in clinical setting (outpatients)	SI group: 44.5 (10.4) No SI group: 47.0 (10.8)	SI group: 43.4 No SI group: 32.3	93	1 week of signal (10/day) sampling via PDA (*compliance* = 61.4%)	Social interaction quantity Social interaction appraisals	SI
Dodd et al. (2022) USA	Emerging adults recruited in clinical, community and college setting	25.4 (7.6)	100	130	2 weeks of signal (6/day) and event sampling via palm-top computers and laminated card (*compliance* = not reported)	NSSI behaviours	Interpersonal problems
Franssens et al. (2023) Belgium	Emerging adults recruited in a community and clinical setting	20.96 (1.63)	64.9	131	14 days of interval (1/day) sampling via website link (*compliance* = not reported)	NSSI thoughts Interpersonal distrust Rejection sensitivity	Insecure attachment
Gerner, Moscardini, Mitchell, Hill, & Tucker (2023) USA	Emerging adults recruited in a community setting	19.12 (1.29)	69.7	43	10 days of signal (5/day) sampling via smartphone (*compliance* = 85.76%)	Interpersonal hopelessness about TB Interpersonal hopelessness about PB Suicidal desire	N/A

(*continued on next page*)

Table 1 (*continued*)

Reference, Country	Developmental Stage of Sample and Setting	Mean Age (SD)	Female (%)	n	ESM Methodology (Duration, Sampling Frequency, Density, Mode of Assessment, Mean/ Median Compliance)	ESM Variables	Baseline Variables
Glenn et al. (2022) USA	Emerging adults recruited in clinical setting (outpatients)	20.35 (2.97)	77.7	103	28 days of signal (6/day) and interval (1/day) sampling via smartphone (*compliance* = not reported)	SI TB Interpersonal Negative Life Events	NSSI history SI SB
Hadzic et al. (2020) Germany	(Emerging) adults recruited in clinical setting (inpatients)	37.6 (14.0)	69	84	6 days of signal (10/day) sampling via smartphone (*compliance* = 89.7%)	SI	TB PB SI Suicidality Capability for suicide
Haliczer and Dixon-Gordon (2023) USA	Adults recruited in a community setting	21.01 (3.19)	100	134	14 days of interval (1/day) sampling via e-mail (*compliance* = 83.10%)	Social stressors Social stressor distress, conflict and confusion NSSI urges NSSI behaviours	N/A
Hallensleben et al. (2019) Germany	(Emerging) adults recruited in clinical setting (inpatients)	37.6 (14.3)	71.6	74	6 days of signal (10/day) sampling via smartphone (*compliance* = 89.7%)	SI (active and passive) TB PB	N/A
Halverson et al. (2023) USA	Adults recruited in clinical setting	46.7 (12.8)	72.5 male	40	28 days of signal (3/day) and event sampling via smartphone (*compliance* = 81.6%)	Interpersonal stressors (dichotomous and continuous) NSSI urges NSSI engagement	N/A
Hamilton et al. (2024) USA	Adolescents recruited in a community	16.15 (0.97)	49	60	8 weeks of signal (3/day) sampling via smartphone (*compliance* = not reported)	Emotional responses to social media (e.g., social comparison, fear of missing out, positive/ negative social interactions, social support) SI	Lifetime SI Suicidal behaviours NSSI
Hepp, Carpenter, et al. (2021) Germany	Emerging adults recruited in community and clinical setting	23.92 (6.72)	100	51	14 days of signal (5/day) and event sampling via smartphone (*compliance* = 92.04%)	NSSI events NSSI urges Interpersonal events (negative and positive, and their distress)	NSSI frequency, severity, methods
Hepp, Störkel, et al. (2021) *Country* = not reported	Emerging adults recruited in clinical setting	26.07 (7.2)	82.1	56	21 days of signal (average of 6/day) and event sampling via smartphone (*compliance* = 89.3%)	NSSI urges Interaction partners Activities (e.g., socializing) Interpersonal stressors (e.g., feeling rejected)	N/A
Hutchinson et al. (2021) USA	Adolescents recruited in community setting	15.06 (1.21)	100	93	10 days of interval (1/day) sampling online (*ESM tool* = not reported) (*compliance* = 88%)	Peer connectedness	SI
Husky et al. (2017) France	(Emerging) adults recruited in clinical setting (inpatients)	37.9 (12.8)	73.8	42	7 days of signal (5/day) sampling via PDA (*compliance* = 73.8%)	SI Social context Daily life events	Number of suicide attempts Severity of last suicide attempt
Jacobucci et al. (2023) USA	Adults recruited in community setting	25.88 (5.84)	62.9	35	30 days of signal (4/day) sampling via smartphone (*compliance* = 60.6%)	Active SI PB TB	N/A
Janssens et al. (2023) Belgium	Adolescents recruited in community setting	13.86 (1.86)	48	1450	6 days of signal (10/day) sampling via smartphone (*compliance* = 43.86%)	Non-suicidal and suicidal self-harm thoughts and behaviours	Maternal attachment insecurity Paternal attachment insecurity Peer attachment insecurity
Janssens, Lafit, De Corte, et al. (2023) Belgium	Adolescents recruited in community setting	13.76 (1.86)	63	1780	6 days of signal (10/day) sampling via smartphone (*compliance* = 41%)	Non-suicidal and suicidal self-harm thoughts and behaviours Loneliness	Parental attachment relationship quality
Janssens, Lafit, Simsa, et al. (2023) Belgium	Adolescents recruited in community setting	14.13 (1.92)	67	1014	6 days of signal (10/day) sampling via smartphone (*compliance* = 44.41%)	Non-suicidal and suicidal self-harm thoughts and behaviours	Parental and peer attachment relationship quality
Kaurin et al. (2022) USA	(Emerging) adults recruited in clinical and community setting	33.71 (9.43)	80	186	21 days of event sampling via smartphone (*compliance* = not reported)	Interpersonal experiences SI	N/A
Kleiman et al. (2017) North America and Europe	Study 1: Emerging adults recruited in community setting Study 2: Adults recruited in clinical setting (inpatients)	Study 1 23.24 (5.26) Study 2 47.74 (13.06)	Study 1 79.6 Study 2 44.1	Study 1 54 Study 2 36	Study 1: 28 days of signal (4/day) and event sampling via smartphone Study 2: average of 10.32 days of signal (4/day) sampling via smartphone (*compliance* = 62.75%)	SI PB Loneliness	Suicide history

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Table 1 (*continued*)

Reference, Country	Developmental Stage of Sample and Setting	Mean Age (SD)	Female (%)	n	ESM Methodology (Duration, Sampling Frequency, Density, Mode of Assessment, Mean/ Median Compliance)	ESM Variables	Baseline Variables
Koenig et al. (2021) Germany	Adolescents recruited in clinical setting (outpatients)	15.48 (1.19)	100	73	2–4 days of signal (12/day) sampling via smartphone (*compliance* = not reported)	NSSI urges Attachment to significant others (mother/best friend) Distracting behaviour (e.g., meeting with friends) NSSI	NSSI frequency, methods, severity
Kim et al. (2023) Korea	Adults recruited in community setting	22.47 (3.35)	56	60	14 days of signal (4/day) sampling via smartphone (*compliance* = not reported)	Anger toward others Feeling of rejection Loneliness	Suicidal and non-suicidal self-injurious behaviours
Kyron et al. (2023) Australia	Adolescents and (emerging) adults recruited in clinical (inpatient) setting	27.97 (12.02)	89.9	1265	Average of 27 days of interval (1/day) sampling via electronic tablet device (*compliance* = 60%)	TB PB NSSI	
MacNeil et al. (2023) Canada	Adolescents recruited in both clinical (outpatients) and community setting	15.55 (1.55)	Lower risk group: 65.6 Higher risk group: 86.96	55	10 days of interval (1/day) sampling (*ESM tool* = not reported) (*compliance* = 89.45%)	PB Loneliness Negative social interactions	SI
Mereish, Peters, Brick, Killam, & Yen (2023) USA	Adolescents recruited in both clinical (inpatients and outpatients) and community setting	16.45 (1.81)	35	92	28 days of interval (1/day) sampling via e-mail (*ESM tool* = not reported) (*compliance* = 76%)	NSSI ideation and behaviours SI and SB External/distal and internal minority stress events	Suicidal and non-suicidal self-injurious behaviours
Mou et al. (2018) USA	Adults recruited in clinical setting (inpatients)	44.3 (13.27)	45.7	35	Average of 8.8 days (2 to 46 days) of signal (4/day) sampling via smartphone (*compliance* = 57%)	Affect (e.g., lonely, abandoned, humiliated) SI	N/A
Mournet et al. (2022) USA	Adults recruited in community setting	19.38 (0.999)	70.27	74	8 weeks of signal (6/day) and event sampling via smartphone (*compliance* = 69.5%)	Loneliness Burdensomeness Support seeking SI	N/A
Nock et al. (2009) USA	Adolescents and emerging adults recruited in community setting	17.3 (1.9)	86.7	30	14 days of signal (2/day) and event sampling via PDA (*compliance* = not reported)	Self-injurious thoughts and behaviours (NSSI, suicide attempt) Social context	Self-injurious thoughts and behaviours (NSSI, SI, suicide attempt)
Oppenheimer et al. (2020) USA	Adolescents recruited in clinical setting	13.56 (1.5)	53	36	10 days of signal (14 calls per 5 days) sampling via phone (*compliance* = 85%)	Negative social experiences	SI severity
Parrish et al. (2021) USA	Adults recruited in clinical setting	43.9 (11.2)	53	96	10 days of signal (3/day) sampling via smartphone (*compliance* = 80.8%)	PB TB Social context	Lifetime SI Lifetime SB Current SI Suicide severity in the past 48 h PB TB
Parrish et al. (2021) USA	Adults recruited in clinical setting	43.4 (12.0)	55.1	128	10 days of signal (3/day) sampling via smartphone (*compliance* = 79.9%)	Social approach Social avoidance	SI Suicide attempts
Peters et al. (2022) Canada	(Emerging) adults recruited in clinical setting (inpatients)	36.3 (13.0)	69.2	39	Average of 12 days of interval (3/day) sampling via smartphone (*compliance* = not reported)	SI Social connectedness	SI Past suicide attempts
Rath et al. (2019) Germany	(Emerging) adults recruited in clinical setting (inpatients)	37.6 (14.3)	71.6	74	6 days of signal (10/day) sampling via smartphone (*compliance* = 89.7%)	SI TB PB	SI
Rogers (2023) USA	Adults recruited in community setting	27.12 (8.60)	61.6	237	Two weeks of signal (6/day) sampling via smartphone (*compliance* = 69.1%)	SB (plans, preparations and attempts) PB TB	N/A
Ruork et al. (2022) USA	Adults recruited in clinical and community setting	28.02 (6.74)	85.7	16	14 days of signal (4/day) sampling via smartphone (*compliance* = 48.5%)	Invalidating responses from others NSSI urges Suicide urges	N/A
Santangelo et al. (2017) Germany	Adolescents recruited in community and clinical setting (outpatients)	15.9 (1.25)	100	46	4 days of signal (12/day) sampling via smartphone (*compliance* = 82%)	Attachment to significant others (mother/best friend)	NSSI
Schwartz-Mette et al. (2023) USA	Adolescents recruited in community setting	For *n* = 107: 12.61 (0.93)	63.4	362	7 days of signal (3/day) sampling via smartphone (*compliance* = 81%)	COVID-19 loneliness	NSSI frequency Past SB SI frequency Likelihood of future

(*continued on next page*)

Table 1 (*continued*)

Reference, Country	Developmental Stage of Sample and Setting	Mean Age (SD)	Female (%)	n	ESM Methodology (Duration, Sampling Frequency, Density, Mode of Assessment, Mean/ Median Compliance)	ESM Variables	Baseline Variables
		For *n* = 255: 16.04 (1.16)					attempt Communication to others about SB
Sels et al. (2022) *Country* = not reported	Adults recruited in a clinical setting (outpatients)	35 (12.27)	62	57	4 weeks of signal (5/day) and interval (1/day) sampling via smartphone (*compliance* = 31%)	Active SI Passive SI Perceived responsiveness TB PB	N/A
Shingleton et al. (2013) USA	Adolescents recruited in community setting	17.0 (1.9)	87	30	14 days of event sampling via PDA (*compliance* = N/A)	Social context SI SB NSSI thoughts NSSI behaviours	Self-injury Self-injury history
Smith et al. (2024) USA	(Emerging) adults recruited in a community setting	32.16 (8.6)	24.2	99	30 days of signal (4/day) sampling via smartphone (*compliance* = 74.43%)	Interpersonal risk factors	SI history Suicidal behaviour history
Stanley et al. (2021) USA	(Emerging) adults *Setting* = not reported	30.6 (11.0)	86	50	7 days of signal (6/day) sampling via PDA (*compliance* = 70%)	SI Coping strategies (e.g., socializing)	Suicide attempts NSSI history SI
Turner et al. (2019) Canada	Emerging adults recruited in community setting	23.25 (4.25)	85	60	14 days of interval (1/day) sampling via e-mail (*ESM tool* = not reported) (*compliance* = not reported)	Fleeting NSSI thoughts Persistent NSSI thoughts NSSI behaviours NSSI urges Perceived support Coping strategies (e.g., support seeking)	NSSI frequency
Turner, Cobb, et al. (2016) Canada	Emerging adults recruited in community sample	23.25 (4.25)	85	60	14 days of interval (1/day) sampling via e-mail (*ESM tool* = not reported) (*compliance* = 87.5%)	NSSI engagement NSSI urges Perceived social support Interpersonal conflict	NSSI frequency, duration and severity
Turner et al. (2017) Canada	Emerging adults recruited in community setting	23.5 (4.66)	77.6	116	14 days of interval (1/day) sampling via e-mail (*ESM tool* = not reported) (*compliance* = not reported)	Interpersonal contact Social support Support seeking Negative interpersonal interactions	NSSI history Support seeking
Turner, Yiu, et al. (2016) Canada	Emerging adults recruited in community setting	23.12 (3.81)	92	25	14 days of interval (1/day) sampling via e-mail (*compliance* = not reported)	NSSI Activities preceding NSSI Stressors preceding NSSI Emotions preceding NSSI	NSSI
Victor et al. (2019) USA	Emerging adults recruited in community setting	22.0 (1.55)	100	62	21 days of signal (7/day) sampling on smartphone (*compliance* = not reported)	Self-injurious urges Interpersonal experiences	History of SI, plans, gestures, attempts NSSI thoughts and behaviours

Note. ESM = Experience Sampling Method, PDA = Personal Digital Assistant device, NSSI = Non-Suicidal Self-Injury, SI = Suicidal Ideation, SB = Suicidal behaviour, TB = Thwarted Belongingness, PB = Perceived Burdensomeness, N/A = Not Applicable.

general, and social connectedness (n = 4); belongingness, including family, peer, and thwarted belongingness (n = 11); and perceived burdensomeness (*n* = 15; Table 3). Other IPs investigated by more than one study were social and professional support (*n* = 9), loneliness, including COVID-19-related loneliness (n = 8), interpersonal experiences (n = 4), social context (n = 4), interpersonal events (n = 5), interpersonal/social stressors (n = 4), interpersonal coping strategies (*n* = 3), negative interpersonal/social interactions (n = 2), attachment (n = 5) and interpersonal conflict (n = 2; Table 3). Table 3 also includes several IPs (e.g., interaction partners and social interaction appraisals) that were investigated by only one study.

Assessment of IPs: Questionnaires and ESM items. Table 3 presents details on how ESM items were operationalized (i.e., item wording, time framing, and response options). The assessment of IPs was heterogeneous, as various instruments were used. Except for seven studies that investigated IPs using a retrospective self-report questionnaire, the majority of studies (*n* = 51) investigated IPs in daily life using an ESM measure. From those, 11 studies based their ESM measure of IPs on standard, retrospective self-report questionnaires. Twenty-four of the 50 studies did not report the full wording of their ESM items that assessed IPs. Of the 23 studies that did report full-text wordings of their ESM items, there was considerable variation in operationalization with studies using different items for the same interpersonal construct or similar items to assess different constructs. For example, across the studies we reviewed, connectedness was assessed using three different ESM item operationalizations, perceived burdensomeness was assessed using ten different ESM item operationalizations, belongingness was assessed using nine different ESM item operationalizations, support was assessed using ten different ESM item operationalizations, both interpersonal experiences and social context were assessed using three different ESM item operationalizations, and coping strategies/behaviour were assessed using three different item operationalizations. Further, there was a considerable amount of overlap in the item wordings that were used to assess different constructs.

There was a high heterogeneity in the timeframes (e.g., referencing to the last 24 h, since the past beep, right now) and response options that were used to operationalize the same or a similar construct. To assess IPs in daily life, the majority of studies used a 5-point Likert response scale (*n* = 14), twelve studies used a 7-point scale, six studies used a 6-point scale, six studies used a binary yes/no scale, four studies used a Visual

Table 2
Reporting quality across all ESM studies.

Reporting quality criteria	Percentages of study compliance (n)			
	Full	Partial	No	N/A
Title and abstract				
ESM/EMA/AA/IL in title and keywords	53.45% (31)	29.31% (17)	17.24% (10)	
Introduction				
Rationale for using ESM	70.69% (41)	24.14% (14)	5.17% (3)	
Method				
ESM training implemented and how	32.76% (19)	5.17% (3)	62.07% (36)	
Procedures to enhance compliance	72.41% (42)	12.07% (7)	15.52% (9)	
Technology specified (hardware and software)	62.07% (36)	18.97% (11)	18.97% (11)	
Sample size justified (conducted power analysis)	12.07% (7)	8.62% (5)	79.31% (46)	
Rationale for sampling design	12.07% (7)	6.90% (4)	81.03% (47)	
Rationale for sampling density	12.07% (7)	20.69% (12)	67.24% (39)	
Technical details on sampling	36.21% (21)	24.14% (14)	39.66% (23)	
Design features	10.34% (6)	8.62% (5)	81.03% (47)	
Full text of items	53.45% (31)	34.48% (20)	12.07% (7)	
Item reliability and validity	39.66% (23)	34.48% (20)	25.86% (15)	
Valid and missing data defined	24.14% (14)	24.14% (14)	51.72% (30)	
Data analysis preparation	56.90% (33)	24.14% (14)	18.97% (11)	
Data analysis	53.45% (31)	43.10% (25)	3.45% (2)	
Results				
Data description	51.72% (30)	29.31% (17)	36.21% (21)	
Prompt delivery	46.55% (27)	12.07% (7)	39.66% (23)	1.72% (1)
Latency	10.34% (6)	3.45% (2)	84.48% (49)	1.72% (1)
Compliance rate	51.72% (30)	41.38% (24)	12.07% (7)	1.72% (1)
Missing data	13.79% (8)	3.45% (2)	81.03% (47)	1.72% (1)
Limitations	39.66% (23)	31.03% (18)	29.31% (17)	
Transparency and reproducibility				
Pre- or post-registration	6.90% (4)	0% (0)	93.10% (54)	
Open materials	10.34% (6)	5.17% (3)	84.48% (49)	
Open code	8.62% (5)	3.45% (2)	87.93% (51)	
Open data	6.90% (4)	12.07% (7)	81.03% (47)	

Note. N/A = not applicable (i.e., criteria are not applicable to studies that were limited to event-contingent sampling).

Analogue Scale (VAS), three studies used sliding scales, two studies used a 10-point scale and another two studies used a 3-point scale.

Between- and within-person design. Table 4 presents the main findings of the ESM studies. Associations between IPs and SITBs were investigated at the between-person (n = 26) and within-person level (n = 39).

2. **How are differences in IPs *between* individuals associated with SITBs?**

IPs associated with suicidal thoughts/urges. Across the eleven

Table 3
ESM operationalization.

Constructs assessed using ESM	Reference	Details on Items
Interpersonal Constructs		
PB	Al-Dajani & Czyz, 2022 Czyz, Horwitz, et al. (2019)	Participants were asked to reflect on feelings of burdensomeness within the last 24 h.
	Czyz et al. (2021)	"I felt people in my life would be happier without me" (based on INQ) 7-point scale, 1: not at all true for me – 7: very true for me
	Coppersmith et al. (2019) Kleiman et al. (2017)	Participants were asked to rate how much they felt burdensomeness. 5-point scale, 0: not at all – 4: very much *Item wording not reported.*
	Mournet et al. (2022)	"How burdensome did you feel today?" 0: not at all burdensome – 10: very burdensome
	Hallensleben et al. (2019)	"I feel useless"
	Sels et al. (2022)	"I feel like a burden for others" 5-point scale, 0: not at all – 5: extremely
	Parrish et al. (2021)	"Since the past alarm, how much have you felt that you were a burden on others?" *Response scale not reported.*
	Jacobucci et al. (2023)	"Like a burden" 5-point scale, 1: very slightly or not at all – 5: extremely
	Rogers (2023)	"Since the last assessment, I have felt like a burden on the people in my life" (based on INQ) "Since the last assessment, I have felt useless" (based on INQ) 7-point scale, 0: not at all – 6: extremely
	MacNeil et al. (2023)	Participants selected the statement that applied best to them: (0) "Think that people in my life are happier when I'm around"; (1) "Do not think that people in my life would be happier if I were gone"; (2) "I wonder that people in my life would be happier if I were gone"; (3) "I am sure that people in my life would be happier if I were gone".
	Kyron et al. (2023)	"In the past 24 h, I have felt like a burden" "In the past 24 h, I have felt like my death would be a relief to people." (based on INQ) 7-point scale, 1: not at all – 7: very true for me
	Smith et al. (2024)	"I feel effective" [reverse-scored] (based on INQ) VAS, 0: not at all – 100: very much
Interpersonal hopelessness about PB	Gerner, Moscardini, Mitchell, Hill, & Tucker (2023)	"I believe I will always fail the people in my life" VAS, 0: not at all – 1: completely (responses up to two decimal)
TB	Coppersmith et al. (2019)	Participants were asked to rate how much they felt lonely. *Item wording not reported.*

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Table 3 (*continued*)

Constructs assessed using ESM	Reference	Details on Items
		5-point scale, 0: not at all – 4: very much
	Glenn et al. (2022)	Family/friend belongingness (based on INQ): "My family/friends care about me" "I feel disconnected from my family/friends" "I feel that I can turn to my family/friends in times of need" "I am close to my family/ friends" 4-point scale, 0: not at all – 3: very much
	Parrish et al. (2021)	"Since the past alarm, how much have you been feeling like you belong or fit with others in your life?" *Response scale not reported.*
	Jacobucci et al. (2023)	"Like I do not belong" 5-point scale, 1: very slightly or not at all – 5: extremely
	Hallensleben et al. (2019)	"I feel lonely"
	Sels et al. (2022)	"I feel like I do not belong." 5-point scale, 1: not at all – 5: extremely
	Rogers (2023)	"Since the last assessment, I have felt like I belong" "Since the last assessment, I have felt lonely" (based on INQ) 7-point scale, 0: not at all – 6: extremely
	Kyron et al. (2023)	"In the past 24 h, I have felt that people care for me." "In the past 24 h, I have felt close to others." (based on INQ) 7-point scale, 1: not at all – 7: very true for me
Interpersonal hopelessness about TB	Gerner, Moscardini, Mitchell, Hill, & Tucker (2023)	"I expect that people will never care about me" VAS, 0: not at all – 1: completely (responses up to two decimal)
Loneliness	Kleiman et al. (2017) MacNeil et al. (2023)	Participants were asked to rate how much they felt lonely. *Item wording not reported.* 5-point scale, 0: not at all – 4: very much
	Kim et al. (2023)	Participants were asked to mark their experienced emotion. Loneliness was listed. *Item wording not reported.* VAS, 0: not at all – 10: very much
	Brown et al. (2023)	"I felt lonely." "I felt that I lacked companionship." "I felt left out." "I felt isolated from others." 5-point scale, 1: not at all – 5: extremely
	Janssens, Lafit, De Corte, et al. (2023)	"I feel lonely" 7-point scale, 1: not at all – 7: very much
COVID-19 loneliness	Schwartz-Mette et al. (2023)	*Item wording not reported.* 5-point scale, 1: rarely/none of the time – 5: almost always/all of the time
Connectedness	Czyz, Horwitz, et al. (2019) Czyz et al. (2021)	Referencing the last 24-h, participants were asked each day to rate the extent of their sense of connectedness to others.

Table 3 (*continued*)

Constructs assessed using ESM	Reference	Details on Items
		"I am close to other people" (based on INQ) 7-point scale, 1: not at all true for me – 7: very true for me
Social connectedness	Peters et al. (2022)	"How close or connected to people do you feel right now?" VAS, 0–100
Peer belongingness	Al-Dajani & Czyz, 2022	Participants were asked to reflect on feelings of peer belongingness within the last 24 h. "I felt close to my friends" 7-point scale
Peer connectedness	Hutchinson et al. (2021)	Participants were instructed to indicate how close and/or connected to their peers they had felt that day. *Item wording not reported.* Sliding scale, 0: not at all – 100: extremely
Family belongingness	Al-Dajani & Czyz, 2022	Participants were asked to reflect on feelings of family belongingness within the last 24 h. "I felt close to my family" 7-point scale
Reaching out to personal support	Al-Dajani et al. (2022)	Each day, adolescents reported engagement in eight coping strategies in reference to either SI or, when SI was not present, feelings or stressful events. The eight coping strategies were: (1) talked with a friend or peer, (2) talked with a parent or family member, (3) contacted a crisis line (call, text, or chat), (4) talked with a therapist, counselor, or doctor, (5) did something relaxing or comforting, (6) distracted self with something else, (7) tried to tell self something calming or positive, and (8) either (a) thought about reasons for living (on days when SI was endorsed) or (b) thought about something that makes self feel better (on days without ideation). *Item wording not reported.* 3-point scale
Reaching out to professional support	Al-Dajani et al. (2022)	Each day, adolescents reported engagement in eight coping strategies in reference to either SI or, when SI was not present, feelings or stressful events. The eight coping strategies were: (1) talked with a friend or peer, (2) talked with a parent or family member, (3) contacted a crisis line (call, text, or chat), (4) talked with a therapist, counselor, or doctor, (5) did something relaxing or comforting, (6) distracted self with something else, (7) tried to tell self something calming or positive, and (8) either (a) thought about reasons for living (on days when SI was endorsed) or (b) thought about something that makes self feel better (on days without ideation). *Item wording not reported.* 3-point scale

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Table 3 (*continued*)

Constructs assessed using ESM	Reference	Details on Items
Support seeking	Mournet et al. (2022)	Each night, participants were provided with a list of things they did to cope with stress or negative emotion during that day, including: "Sought support from other people." 0: did not seek social support – 1: sought social support
Social support seeking	Brown et al. (2023)	Each day, participants responded (yes/no) to the statement: "Today, I sought out emotional or practical help/support from someone." Yes/no
Barriers to seeking support	Brown et al. (2023)	Each day, participants responded (yes/no) to the statement: "Today, I sought out emotional or practical help/support from someone." Yes/no If no: "I did not seek out social support today because I worried that I would be a burden to other people." "I did not seek out social support today because I felt that I didn't have anyone who could or would help me" 6-point scale, 1: not at all – 5: extremely/very much so
Social support	Coppersmith et al. (2019)	Participants were asked to rate how supported they felt from friends and family (in two separate items) that day compared to a typical day. *Item wording not reported.* 5-point scale, 1: felt much less – 5: felt much more
Social support on social media	Hamilton et al. (2024)	"Thinkin about the last time you used social media, how much did you feel supported or encouraged by others?" 7-point scale, 0: not at all – 6: extremely
Perceived support	Turner et al. (2019)	Goldsmith Social Support Scale (GSS) 12 items that were provided 3 times a day (morning, afternoon and evening) whether they had contact (defined as any interaction, including phone calls, text messages, emails, social media interaction, or in-person interaction) with any of the following sources of support: romantic partners family members friends or peers participants then rated the quality of these interactions using 12 bipolar adjective pairs for each source of support *Item wording not reported.*
Perceived social support	Turner, Cobb, et al. (2016) Turner et al. (2017)	Goldsmith Social Support Scale (GSS) Twelve adjective pairs to assess perceptions of support (e.g., "My romantic partner was… helpful-unhelpful, selfish-generous"). Participants provided ratings for three potential sources of support: romantic partners, parents, and peers. Ratings were only provided if the participant first endors having had contact (either in person or remotely, e.g., via text message, email, phone call) with that source of support during each daily period (morning, afternoon, evening). Scores on these items are summed and averaged, providing an average daily perceived support score. *Item wording not reported.* 7-point scale, 1: very unsupportive – 7: very supportive
	Christensen et al. (2023)	"At this moment… I have someone who understands my problems" "At this moment… I feel there are people I can talk to if I am upset" 5-point scale, 1: not at all – 5: very much
Perceived responsiveness	Sels et al. (2022)	"To what extent did you feel this person understood you?" "To what degree did you feel that this person expressed liking and encouragement for you?" "To what degree did you that this person valued your abilities and opinions?" Slider scale, not at all – fully
Interpersonal experiences	Berghoff et al. (2022)	Participants reported if certain positive or negative interpersonal experiences occurred before and/or after the NSSI by selecting one or more of the following options: (positive) "someone paid attention to you or showed you they cared" "someone complimented you" "someone helped you with something" "someone gave you support" or (negative) "someone was upset with you" "someone let you down" "someone rejected or ignored you" "you had a fight with someone." *Item wording not reported.* Yes/no
	Victor et al. (2019)	"Since the last prompt have you…?" felt insulted or criticized (criticism) felt rejected, abandoned, excluded, or left out (rejection) 5-point scale, 1: not at all – 5: extremely
	Kaurin et al. (2022)	Participants were asked to report on the behaviour of one of their interaction partners (regarding dominance and warmth). *Item wording not reported.* Sliding scale dominance, −50: accommodating/submissive/timid - +50: assertive/dominant/controlling

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Table 3 (*continued*)

Constructs assessed using ESM	Reference	Details on Items
		Sliding scale warmth, −50: cold/distant/hostile - +50: warm/friendly/caring "How nervous/sad/irritated/ angry/happy/content/excited did you feel during the interaction?" (based on Positive and Negative Affect Schedule) Sliding scale, 0: not at all – 100: extremely "How would you describe your behaviour during the interaction?" Sliding scale, 0: in control – 100: impulsive
Feeling of rejection	Kim et al. (2023)	Participants were asked to mark their experienced emotion. Feeling rejected was listed. *Item wording not reported.* VAS, 0: not at all – 10: very much
Rejection sensitivity	Franssens et al. (2023)	"Today, I was afraid to be rejected by someone who is important to me" 5-point scale: 1: not true at all – 5: very true
Exclusion	Defayette et al. (2023)	"Since your last survey, how strongly have you felt excluded?" 11-point scale, 0: not at all – 10: very strongly
Interpersonal Negative Life Events	Glenn et al. (2022)	Participants were asked to indicate whether a range of interpersonal negative life events occurred that day (based on Life Events Scale for Children; LES-C): (1) arguments/disagreements, (2) disappointments, (3) rejection, (4) loss, (5) humiliation/ embarrassment, (6) victimization. Events were clustered based on the relationship to the participant: family, friends/peers, significant other/romantic partner, other. *Item wording not reported.*
Discrimination and rejection (as one construct)	Botelho et al. (2023)	To investigate external gender minority stress, the subscales of the Gender Minority Stress and Resilience Scale were condensed and modified. Two items were combined to represent a discrimination and rejection subscale: "I felt unfairly treated or discriminated against at my place of work, residence, school, or other place because of my gender identity or expression" (i.e., discrimination item) "I was rejected, distanced, or made to feel unwelcome by friends, family, acquaintances, co-workers, or other people in my community because of my gender identity or expression" (i.e., rejection item) 7-point scale, 1: strongly disagree – 7: strongly agree
Violence	Botelho et al. (2023)	Five items assessing victimization were summed into a count of violence,

Table 3 (*continued*)

Constructs assessed using ESM	Reference	Details on Items
		including verbal harassment, threats of being outed/ blackmailed, physical violence (e.g., pushed, shoved, hit), and sexual violence (i.e., "sexual contact…against my will") *Item wording not reported.* 0: no – 1: yes
Interpersonal events	Hepp, Carpenter, et al. (2021)	Participants were asked to report significant positive and negative Interpersonal events during random prompts and self-initiated NSSI prompts. Participants were instructed to select all items that applied. "Since the last beep/before I self-harmed, someone criticized me" (negative) rejected/excluded me" (negative) ignored my needs/feelings" (negative) behaved angry/aggressive toward me" (negative) let me down/disappointed me" (negative) supported/helped me" (positive) showed me affection" (positive) respected my needs or feelings" (positive) gave me their attention or time" (positive) was interested in me, understood me" (positive) If any event was endorsed, participants were asked: "What the person did was a reaction to my last NSSI" Yes/no/don't know "What the person did distressed me" 6-point scale, 0: not at all – 5: very deeply
Negative peer events	Defayette et al. (2023)	"Peer" means a friend, classmate, or significant other. Since your last survey, have you… argued with a peer? been harassed or picked on by a peer (in person or online)? been left out of a conversation that your peers were having? been left out of an activity that your peers were doing? overheard or was told that a peer was talking badly about you? been ignored by a peer? spent time hanging out with a peer? done a fun activity with a peer? been invited to a party by a peer? had a peer stick up for you? been complimented by a peer? received positive attention (likes/comments) from peers on a social media post? had any other interaction with peers that didn't feel so good? had any other interaction with peers that felt good? Yes/no

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Table 3 (*continued*)

Constructs assessed using ESM	Reference	Details on Items
Interpersonal stressors	Hepp, Störkel, et al. (2021)	Participants indicated if they had experienced a: disagreement with anyone felt rejected felt let down by someone they depend on since the last prompt. *Item wording not reported.*
	Halverson et al. (2023)	Interpersonal stress was measured with dichotomous "Have you been experiencing an interpersonal problem with another person that has caused you stress during the past four hours?" Yes/no and continuous "How much stress has this interpersonal problem caused you during the past four hours?" 5-point scale: 0: none – 4: extreme
Social stressors	Haliczer & Dixon-Gordon, 2023	Participants were instructed to identify the social interaction or event that was most stressful or upsetting for them that day and answer questions about: How distressing they found it 0: no distress at all – 100: extremely distressing The degree of disagreement/ conflict/tension 10-point scale, 1: very little – 10: a great deal The degree of confusion/mixed feelings 10-point scale, 1: very little – 10: a great deal *Item wording not reported.*
External and internal minority stressors	Mereish, Peters, Brick, Killam, & Yen (2023)	Nine-item EISS assessed external minority stress events (e.g., ""People stared at me because of my identity" or "I was targeted or harassed because of my identity") If any of the nine items were endorsed, participants indicated whether they attributed the experience to one or more identity (e.g., sexual orientation, gender identity or expression, race or ethnicity. A sum score for each day was created to indicate the total number of the nine different stress events that occurred each day. 0: no – 1: yes Two items were used to assess internalized minority stressors: Internalized stigma: "I was uncomfortable with being LGBTQ" Daily concealment of sexual orientation and/or gender identity was assessed with one item: "I hid part of my LGBTQ identity from other people" 5-point scale, 0: not at all/very slightly – 4: very true/ extremely

Table 3 (*continued*)

Constructs assessed using ESM	Reference	Details on Items
Interpersonal conflict	Turner, Cobb, et al. (2016)	17-item Test of Negative Social Exchange assessed whether participants had experienced negative interpersonal interactions. 4 types of conflict were assessed: hostile/impatient (e.g., someone losing his or her temper, yelling at, or becoming angry with the participant) insensitive (e.g., someone taking the participant for granted, ignoring the participants' wishes or needs) interfering (e.g., distracting the participant when he or she was doing something important) ridiculing (e.g., making fun of, laughing at or gossiping about the participant) interactions. Scores on these items were summed and then averaged, providing an average daily conflict score. *Item wording not reported.* 18-point scale, 0: no conflict – 17: high conflict
	Ammerman and Jacobucci (2023)	Participants were asked, since their last survey completion: "Have you experienced an interpersonal conflict or interpersonally stressful situation?" Responses were coded as present (1) versus absent (0).
Negative Interpersonal Interactions	Turner et al. (2017)	Participants were asked to rate the presence/absence of 17 unpleasant interactions using Test of Negative Social Exchange (TENSE). The TENSE assesses unpleasant interactions in four domains: hostile/impatient interactions (e.g., someone lost his or her temper with me) insensitive (e.g., someone took me for granted) interfering (e.g., someone prevented me from working on my goals) ridiculing (e.g., someone made fun of me). Scores were summed and then averaged. *Item wording not reported.*
Negative social interactions	MacNeil et al. (2023)	Participants selected with whom they had experienced the following four negative social interactions: (1) "[the other person] did not take your problem seriously or belittled you", (2) "gave you unhelpful or unsolicited advice", (3) "ignored you or withdrew from you", (4) "criticized or argued with you". Participants indicated whether they had each interaction with their best friend, other friends, boyfriend or girlfriend, parents, other family members, classmates or coworkers, teachers, or other professionals.
Negative social experiences	Oppenheimer et al. (2020)	Participants were prompted to describe a time when they

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Table 3 (*continued*)

Constructs assessed using ESM	Reference	Details on Items
		experienced the most negative affect in response to a self-nominated event that occurred within the past hour. Coders classified these into: peer (considered social) family (considered social) romantic partners (considered social) health school *Item wording not reported.*
Social invalidation	Ruork et al. (2022)	Items were taken from the Validating and Invalidating Response Scale (VIRS; Lee et al., 2012) and included questions assessing observable behaviour from others (e.g., "The person paid attention to me.") as well as more explicit interpretations of behaviour (e.g., "The person treated my thoughts and feelings like they were reasonable."). Items were combined into a single score for social invalidation. *Item wording not reported.*
Unfavourable social comparisons	Brown et al. (2023)	Participants rated how they felt compared to other people across four dimensions: "Today, compared to other people, I felt": Incompetent/Competent Inferior/superior Left out/accepted Unlikeable/likeable Sliding scale, 0–10
Social comparison on social media	Hamilton et al. (2024)	"Thinking about the last time you used social media, how much did you feel that you aren't as good (e.g., attractieve/accomplished/etc) or popular s other people?" 7-point scale, 0: not at all – 6: extremely
Daily life events	Husky et al. (2017)	Participants were asked to identify the most salient daily life event they experienced since the previous signal and to classify the event according to different categories including different types of social events (e.g., friends, partner, family). *Item wording not reported.*
Stressors preceding NSSI	Turner, Yiu, et al. (2016)	"Did any of the following events happen right before the thoughts started?" you had an argument or conflict with another person you tried to spend time with someone but couldn't someone was disappointed with you someone was angry with you, criticized or put you down someone let you down or broke a promise someone rejected you you lost someone important (even if it was temporary) you were isolated or more alone than you wanted to be you had financial problems you had health problems or physical discomfort you had a new demand you talked about upsetting memories or events
Emotions preceding NSSI	Turner, Yiu, et al. (2016)	"What were you feeling right before?" scared/anxious numb/nothing sad/worthless angry at self self-hatred angry at others rejected/hurt overwhelmed
Coping behaviour	Czyz, Glenn, et al. (2019)	"When you had thoughts of killing yourself in the last 24 h, did you do any of these things to deal or cope with your thoughts?" (1) talked to a family member (copying by relying on personal support), (2) talked to a friend or another support person (copying by relying on personal support), (3) talked to a therapist, counselor, or doctor (copying by relying on professional support), (4) contacted a crisis line (copying by relying on professional support), (5) tried to distract self with something else, (6) tried to relax or do something comforting, (7) tried to tell self something calming or positive, (8) tried a cognitive strategy
Activities preceding NSSI	Turner, Yiu, et al. (2016)	"What were you doing when you started thinking about NSSI?" listening to music eating resting watching TV or a movie socializing working, doing schoolwork or homework recreational activity using drugs drinking alcohol
Activities	Hepp, Störkel, et al. (2021)	Participants indicated which activities they were participating in at the moment. They were allowed to check all options that were applicable to them. watching TV/listening to music socializing working/studying being on the phone sleeping walking other *Item wording not reported.*
Coping strategies	Stanley et al. (2021)	Participants reported whether or not they used each of seven strategies to cope since the last epoch: keeping busy socializing positive thinking doing something good for self calming self finding perspective sitting with feelings until they

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Table 3 (*continued*)

Constructs assessed using ESM	Reference	Details on Items
		passed. In addition, they rated the extent to which they considered the coping strategies they used to be effective in reducing distress. *Item wording not reported.* 5-point scale
	Turner et al. (2019)	Participants were asked to describe a problem or stressor they had encountered that day that was important or caused them to worry. Next, participants rated the extent to which they used each of 15 coping strategies to deal with this problem using an abbreviated version of the Coping Strategy Indicator (CSI) that assessed three broad strategies: problem-focused, support-seeking, and avoidant coping. *Item wording not reported.*
Support seeking	Turner et al. (2017)	15-item version of the Coping Strategy Indicator was used (once per day), participants were instructed to briefly describe a problem they had encountered and, keeping that event in mind, to rate the extent of which they had used each coping strategy. A composite score was used indicating participants' use of support seeking relative to other coping strategies by summing scores and averaging the score. *Item wording not reported.* 3-point scale, 1: not at all – 3: a lot
Social context	Husky et al. (2017)	Participants were asked to describe their current activity (e.g., socializing) and their social company (alone or with close others). *Item wording not reported.*
	Nock et al. (2009) Parrish et al. (2021)	"Who were you with?" Participants noted who they were with categorized as "alone" or "with others". *Item wording not reported.*
Social interaction quantity	Depp et al. (2016)	Participants were asked whether they were alone, whether or not a recent interaction had occurred and a once daily summary of the number of interactions (i.e., 0, 1, 2, 3, 4, or more; proportion of time in an interaction and total amount of interaction within each day). *Item wording not reported.*
	Ammerman and Jacobucci (2023)	Participants were asked, since their last survey completion: "How many friends/family members have you directly communicated with, whether via phone/text message or social media, since the last prompt?" "How many minutes have you spent directly communicating with friends/family since the last prompt?"

Table 3 (*continued*)

Constructs assessed using ESM	Reference	Details on Items
Social interaction quality	Ammerman and Jacobucci (2023)	Participants were asked, since their last survey completion: "How meaningful were your social interactions?". 5-point scale, 1: not at all meaningful – 5: very meaningful (0: no social contact)
Social interaction appraisals	Depp et al. (2016)	Participants were asked to rate interactions (based on Defeatist Performance Attitude Subscale of the Dysfunctional Attitude Scale) If no recent interaction occurred: interactions are worth the effort feel confident in communicating well others think well of respondent want to interact with others I a recent interaction occurred: enjoyed the interaction interaction was worth the effort communicated well interaction partner thought well of respondent *Item wording not reported.*
Interaction partners	Hepp, Störkel, et al. (2021)	Participants indicated whom they had spent time with in the past 15 min. Participants were allowed to check all options that were applicable to them. Options included having spent time with a: romantic partner friend coworker child(ren) parent another family member someone else *Item wording not reported.*
Interpersonal contact	Turner et al. (2017)	Participants were asked to report whether they had contact (defined as inclusive of contact via email messages, phone calls, text messages, social media, and in-person interaction) with their romantic partner(s) (defined as boyfriend, girlfriend, husband, wife, etc.), family members (defined as mother, father, sister, brother, aunt, uncle, cousin, etc.), or friends or peer (s) (defined as friends, classmates, coworkers, acquaintances, etc.) within each of the three diary periods. *Item wording not reported.* Yes/no
Social approach and avoidance	Parrish et al. (2021)	Participants rated their level of social approach and avoidance motivations for later in the day. Social approach: "How much interest or motivation do you have in interacting with others later today?" Social avoidance: "How much do you want to avoid others later today?" 7-point scale
Attachment to significant others	Koenig et al. (2021) Santangelo et al. (2017)	"How close do you feel to your mother/best friend right now?" "How important is your

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Table 3 (*continued*)

Constructs assessed using ESM	Reference	Details on Items
(mother and best friend)		mother/best friend to you right now?" "What do you think, how close does your mother/best friend feel to you right now?" "What do you think, how important are you for your mother/best friend right now?" VAS, 0–100
Distracting behaviour	Koenig et al. (2021)	Participants were asked to indicate whether they engaged in distracting behaviour within the past hour since the preceding assessment. Multiple responses possible: (1) no, no distraction; (2) homework/ learning; (3) watching TV/ playing video games; (4) meeting with friends; (5) sports; (6) relaxing/sleeping; (7) other/other distraction. *Item wording not reported.*
Affect	Mou et al. (2018)	Participants were asked to report on their current experience of each of 10 affect states (abandoned, anxious, desperate, guilty, hopeless, humiliated, lonely, rage, self-hatred, upset). *Item wording not reported.* 10-point scale, 1: low – 10: very high
Anger toward others	Kim et al. (2023)	Participants were asked to mark their experienced emotions. Anger toward others was listed. *Item wording not reported.* VAS, 0: not at all – 10: very much
Interpersonal distrust	Franssens et al. (2023)	"Today, I had the feeling that others wanted to hurt me" 5-point scale, 1: not true at all – 5: very true
SITBs		
Suicidal urge intensity	Al-Dajani & Czyz, 2022 Al-Dajani et al. (2022) Czyz, Horwitz, et al. (2019)	Participants were asked to rate the intensity of their suicidal urge within the last 24 h. "How strong was the urge to act on your thoughts of suicide?" 7-point scale (ranging from 1: low – 7: high)
SI frequency	Al-Dajani et al. (2022)	Participants indicated the frequency with which they experienced SI within the last 24 h. *Item wording not reported.*
	Czyz, Horwitz, et al. (2019)	"How many times did you have thoughts of killing yourself?" 4-point scale, 1: only one time – 4: all the time
	Husky et al. (2017)	Participants were asked to rate the frequency of positive or negative thoughts since the previous assessment. 5-point scale, 1: not at all – 5: a lot, very frequently If negative thoughts (score from 2 to 5): participants were asked if their content included SI or self-harm.
SI	Coppersmith et al. (2019)	Participants were asked to rate their: (1) wish to live, (2) wish to die, and (3) desire to die by suicide (based on Beck Suicide Scale, BSS). 3-point scale, 1: moderate to strong – 2: weak – 3: none (based on Beck Suicide Scale, BSS)
	Czyz, Horwitz, et al. (2019) Czyz, Glenn, et al. (2019) Czyz et al. (2021)	"At any point in the last 24 h, did you have any thoughts of killing yourself?"
	Defayette et al. (2023)	"Since your last survey, have you had thoughts about death or killing yourself?" Yes/no If yes: "When did the thought first occur?" … minutes/h ago "How intense was the thought?" 11-point scale, 0: not at all – 10: very much "How much did you really intent do be dead or kill yourself?" 11-point scale, 0: not at all – 10: very much "Did the thought occur while you were trying to fall asleep last night?" (only appears on the first survey of the day) Yes, at the start of the night; yes, while awake in the middle of the night; no
	Glenn et al. (2022) Gerner, Moscardini, Mitchell, Hill, & Tucker (2023)	Suicide desire: "How intense is your desire to kill yourself right now?" 6-point scale, 0: absent/no desire – 1: present, but not at all intense – 5: extremely intense Suicide intent: "How strong is your intent to kill yourself right now?" 6-point scale, 0: absent/no intent – 1: present, but not at all strong – 5: extremely strong Ability to keep self safe: "How able are you to keep yourself safe right now?" 5-point scale, 1: I definitely CAN keep myself safe – 5: I definitely CANNOT keep myself safe Desire for life: "How strong is your desire to live right now?" 5-point scale, 1: very strong – 5: very weak
	Kaurin et al. (2022)	Desire to die by suicide: "How intense is your desire to kill yourself right now?" Intention to die by suicide: "How strong is your intention to kill yourself right now?" Ability to resist the urge to die by suicide: "How strong is your ability to resist the urge to kill yourself right now?" 5-point scale, 0: not strong/ intense at all – 4: very strong/ intense
	Mereish, Peters, Brick, Killam, & Yen (2023)	"At the worst point in the last 24 h, how intense were your thoughts of killing yourself?" 5-point scale, 0: very low or not at all – 4: very high intensity
	Hadzic et al. (2020)	Participants were asked about their momentary suicidal ideation with 4 items (2 on passive SI and 2 on active SI)

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Table 3 (*continued*)

Constructs assessed using ESM	Reference	Details on Items
		Item wording not reported. 5-point scale, 0: not at all – 4: very much
	Hallensleben et al. (2019) Ammerman and Jacobucci (2023) Sels et al. (2022)	Passive SI: "Life is not worth living for me." "There are more reasons to die than to live for me" Active SI: "I think about taking my life." "I want to die." 5-point scale, 1: very slightly or not at all – 5: extremely
	Jacobucci et al. (2023)	Active SI: "I think about taking my life" 5-point scale, 1: very slightly or not at all – 5: extremely
	Kaurin et al. (2022)	"Have you wished you were dead or wished you could go to sleep and not wake up?" (based on SI subscale of C-SSRS) "Have you actually had any thoughts of killing yourself?" (based on SI subscale of C-SSRS)
	Janssens et al. (2023) Janssens, Lafit, De Corte, et al. (2023) Janssens, Lafit, Simsa, et al. (2023)	"Since the last beep, have you thought about harming yourself?" 7-point scale: 1: not at all – 7: very much If participants indicated a score higher than 2 on this item, the item on self-harm behaviours followed: "Since the last beep, have you actually harmed yourself on purpose?" Yes/no
	Mournet et al. (2022)	Each night, participants were asked whether they had experienced a number of stressful events during the day, including whether they "had suicidal thoughts." 0: did not have SI – 1: had SI
	Mou et al. (2018)	Authors created a composite SI score using three items that assessed (1) desire to die by suicide, (2) intent to die by suicide, and (3) ability to resist the urge to die by suicide. *Item wording not reported.* 10-point scale: 0: none – 9: very much
	Stanley et al. (2021)	Participants were asked to rate how strongly they experienced a wish to live a wish to die a wish to escape thoughts about dying thoughts about suicide urge to die by suicide thoughts about hurting self urges to hurt self and whether they had reasons for living. *Item wording not reported.* 5-point scale, 0–4
	Shingleton et al. (2013)	Participants were asked to self-initiate answers to questions whenever they experienced suicide thoughts/behaviours. *Item wording not reported.*
	Smith et al. (2024)	Passive SI: "I think about wanting to be dead" (adapted from SITBI) "I think about not wanting to wake up" (adapted from SITBI)

Table 3 (*continued*)

Constructs assessed using ESM	Reference	Details on Items
		Active SI: "I am having urges to hurt myself" (adapted from SITBI) "I have a desire to kill myself" (adapted from BSS) VAS, 0: not at all – 100: very much
	Hamilton et al. (2024)	Passive death wish: "Today, I wished I was dead" Yes/no Active SI: "Today, I thought about killing myself" Yes, but I didn't work out the details; Yes, and I thought about the details; No
Self-injurious thoughts	Nock et al. (2009)	Participants were asked if they had experienced a thought of engaging in any self-destructive behaviour (currently or since the last assessment), including suicide attempt (i.e., harming yourself with the intention of dying) or NSSI (i.e., harming yourself without wanting to die), as well as alcohol use, substance use, bingeing, purging, unsafe sex, impulsive spending, or any other self-destructive behaviour. *Item wording not reported.* Yes/no SIT intensity: "Rate how intense the urge was to do the self-injurious/self-destructive behaviour?" 5-point scale, not present – very severe SIT duration: "Indicate how long you thought about doing the behaviour you selected above." 6-point scale: <5 s – 5 h to 1-day
SI duration	Czyz, Horwitz, et al. (2019) Czyz et al. (2021)	"How long did these thoughts last?" 5-point scale, 1: a few seconds or minutes – 5: >8 h/ continuous
NSSI behaviours	Janssens et al. (2023) Janssens, Lafit, De Corte, et al. (2023) Janssens, Lafit, Simsa, et al. (2023)	"Have you ever actually harmed yourself, but without wanting to die?" 0: no never; 1: yes, once; 2: yes, multiple times; I do want to answer this question
	Czyz, Glenn, et al. (2019)	"At any point in the last 24 h, did you harm yourself or hurt your body on purpose (such as cutting/burning your skin, or hitting yourself) without the intention to die?" Yes/no, if yes participants indicated when the behaviour took place.
	Christensen et al. (2023)	"Since the last survey completed… Did you do anything to harm yourself on purpose, but NOT to kill yourself?" Yes/no
	Dodd et al. (2022)	Participants were given a laminated card containing 18 eating disorders and self-destructive behaviours, of

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Table 3 (*continued*)

Constructs assessed using ESM	Reference	Details on Items
		which 5 were considered NSSI: intentionally cutting self, scratching self, burning self, hitting self, banging head. Participants were asked to initiate an ESM survey whenever they engaged in any of those behaviours.
	Turner et al. (2019) Halverson et al. (2023)	Participants were asked to report whether they had engaged in NSSI. Yes/no
	Mereish, Peters, Brick, Killam, & Yen (2023)	"Did you engage in non-suicidal self-injury at any point in the last 24 h?" 0: no – 1: yes
	Koenig et al. (2021)	Participants were asked to indicate whether they engaged in dysfunctional behaviour within the past hour since the preceding assessment. Multiple responses possible: (1) no, high-risk behaviour; (2) cutting, scratching, burning; (3) hitting head against the wall; (4) sexual impulsive behaviour; (5) alcohol, drugs, pills; (6) binge eating, vomiting; (7) other. *Item wording not reported.*
	Hepp, Carpenter, et al. (2021)	"I have hurt myself." (self-initiate ESM assessment) "Since the last prompt I answered, I have hurt myself" Yes/no
	Turner, Cobb, et al. (2016) Turner, Yiu, et al. (2016)	"Did you engage in non-suicidal self-injury today?" (NSSI was defined as injuring yourself without intending to die) Yes/no If participants endorsed NSSI acts, they were asked what method they used, whether anyone knew about the NSSI (and if so, who and how they had come to learn about NSSI), and to rate the perceived impact of NSSI on their emotions and relationships.
	Ruork et al. (2022)	Participants reported whether they had just engaged in NSSI. *Item wording not reported.* Yes/no
	Haliczer and Dixon-Gordon (2023)	"Did any of the following happen? I engaged in self-harm."
NSSI thoughts/ideation	Mereish, Peters, Brick, Killam, & Yen (2023)	"At the worst point in the last 24 h, how intense were your thoughts of engaging in non-suicidal self-injury?" 5-point scale, 0: very low or not at all – 4: very high intensity
	Shingleton et al. (2013)	Participants were asked to self-initiate answers to questions whenever they experienced NSSI thoughts/behaviours. *Item wording not reported.*
	Janssens et al. (2023) Janssens, Lafit, De Corte, et al. (2023) Janssens, Lafit, Simsa, et al. (2023)	"Have you every thought about harming yourself, but without wanting to die?" 0: no never; 1: yes, once; 2: yes, multiple times; I do want to answer this question
	Franssens et al. (2023)	"Today, I had the feeling I wanted to hurt myself"

Table 3 (*continued*)

Constructs assessed using ESM	Reference	Details on Items
		5-point scale, 1: not true at all – 5: very true
Fleeting NSSI thoughts	Turner et al. (2019)	"Did you think of doing the following today (even if it was only a passing thought) – injuring yourself without intending to die?" Yes/no
Persistent NSSI thoughts	Turner et al. (2019)	Alexian Brothers Urges to Self-Injure Scale (ABUSI) 5-items which participants completed retrospectively for three periods each day (morning, afternoon, and evening) 0: absent – 1: present
NSSI urges	Koenig et al. (2021)	"At this moment, how strong is your urge to self-injure?" VAS, 0–100
	Hepp, Störkel, et al. (2021)	"During the last 15 min, the urge to hurt myself was" VAS, 0: no urge at all – 10: I can hardly contain the urge
	Turner et al. (2019)	Alexian Brothers Urges to Self-Injure Scale (ABUSI) 5-items which participants completed retrospectively for three periods each day (morning, afternoon, and evening). *Item wording not reported.* 0: absent – 1: present
	Turner, Cobb, et al. (2016)	Alexian Brothers Urges to Self-Injure Scale (ABUSI) 5-items that participants completed retrospectively for three periods each day (morning, afternoon, and evening) and that assess frequency of NSSI thoughts, strength of NSSI urges, time spent thinking about NSSI, difficulty resisting urges, and overall experience of NSSI urges within each period (e.g., "This morning… how much time did you spend thinking about injuring yourself or about how you want to injure yourself?"). *Item wording not reported.* 7-point scale: 0–6
	Hepp, Störkel, et al. (2021)	Participants were asked to indicate if they had experienced any urges to harm themselves on purpose since the last assessment. *Item wording not reported.* Yes/no
	Ruork et al. (2022)	Participants were asked to provide ratings for urges for NSSI. *Item wording not reported.* 6-point scale, 0–5
	Halverson et al. (2023)	Participants were asked whether they had experienced NSSI urges. *Item wording not reported.*
	Christensen et al. (2023)	"Since the last survey completed… Did you have the urge to hurt yourself on purpose, but not to kill yourself?" Yes/no

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Table 3 (*continued*)

Constructs assessed using ESM	Reference	Details on Items
Self-injurious urges	Haliczer and Dixon-Gordon (2023)	"Did any of the following happen? I had urges of self-harm."
	Victor et al. (2019)	"Since the last prompt, have you..?" felt an urge or wanted to harm or injure yourself on purpose, without wanting to die (such as wanting to cut or burn yourself) felt the urge or wanted to make a suicide attempt 5-point scale, 1: not at all – 5: extremely
SB	Mereish, Peters, Brick, Killam, & Yen (2023)	"Did you make a suicide attempt at any point in the last 24 h?" 0: no – 1: yes
	Rogers (2023)	Composite SB index: Suicide plans: "Since the last assessment, have you made or added to a plan to kill yourself?" Preparations: "Since the last assessment, have you made any preparations for a suicide attempt?" Attempts: "Since the last assessment, have you made a suicide attempt?" Participants who endorsed any one of these three outcomes were scored as "1" and those who denied all three items scored "0".
	Ruork et al. (2022)	Participants reported whether they had just engaged in SB. *Item wording not reported.* Yes/no
	Defayette et al. (2023)	"Since your last survey, considered a plan for killing yourself?" Yes/no "Since your last survey, tried to kill yourself?" Yes/no
	Janssens et al. (2023) Janssens, Lafit, De Corte, et al. (2023) Janssens, Lafit, Simsa, et al. (2023) Shingleton et al. (2013)	"Have you ever tried to end your own life?" 0: no never; 1: yes, once; 2: yes, multiple times; I do want to answer this question Participants were asked to self-initiate answers to questions whenever they experienced self-destructive thoughts/ behaviours. *Item wording not reported.*
Suicide urges	Ruork et al. (2022)	Participants were asked to provide rating for urges for suicide. *Item wording not reported.* 6-point scale, 0–5
Suicidality	Peters et al. (2022)	"How suicidal are you right now?" VAS, 0–100
Acquired capability for suicide	Botelho et al. (2023)	Participants were instructed to rate how they felt overall "I could tolerate a lot more pain than most people" "I was not at all afraid to die" 5-point scale, 1: strongly disagree – 5: strongly agree

Note. ESM = Experience Sampling Method, NSSI = Non-Suicidal Self-Injury, SI = Suicidal Ideation, SB = Suicidal behaviour, TB = Thwarted Belongingness, PB = Perceived Burdensomeness, N/A = Not Applicable.

studies that focused on IPs and suicidal thoughts/urges (Al-Dajani et al., 2022; Al-Dajani & Czyz, 2022; Depp et al., 2016; Hadzic et al., 2020; Hutchinson et al., 2021; Kaurin et al., 2022; MacNeil et al., 2023; Oppenheimer et al., 2020; Parrish et al., 2021; Smith et al., 2024), there are three types of study designs that enabled a better understanding of associations at the between-person level (Table 4). First, three studies investigated cross-sectional associations between IPs and suicidal thoughts across the monitoring period (Al-Dajani et al., 2022; Hadzic et al., 2020; Kaurin et al., 2022) and found that individuals who reached out to personal support more often (Al-Dajani et al., 2022), experienced higher mean levels of perceived burdensomeness (Hadzic et al., 2020) and perceived their interaction partners more often as cold or dominant (Kaurin et al., 2022) than their peers during their everyday lives were more likely to think (more severely) about suicide across the ESM period.

Second, six studies investigated how differences between individuals in suicidal thoughts/urges, measured at baseline, prospectively relate to IPs assessed with ESM in daily life (Hadzic et al., 2020; MacNeil et al., 2023; Oppenheimer et al., 2020; Parrish et al., 2021; Smith et al., 2024). The conclusion we can draw from these studies is that individuals who report thinking about suicide (more) at baseline compared to others, experience higher levels of perceived burdensomeness in their daily lives (Hadzic et al., 2020; MacNeil et al., 2023; Parrish et al., 2021). Three studies investigated whether suicidal thoughts at baseline were associated with daily-life thwarted belongingness, but found conflicting results (Hadzic et al., 2020; Parrish et al., 2021; Smith et al., 2024).

Finally, three studies sought to advance understanding of between-person prospective associations between IPs at baseline and suicidal thoughts/urges in daily life (Al-Dajani & Czyz, 2022; Depp et al., 2016; Hutchinson et al., 2021). These studies found that individuals who experience higher levels of perceived burdensomeness (Al-Dajani & Czyz, 2022) and lower levels of peer connectedness (Hutchinson et al., 2021), and endorse more negative appraisals toward social interactions (Depp et al., 2016) at baseline, are more likely to think (more severely) about suicide in daily life. To date, however, only one study investigated the two-way interaction of thwarted belongingness and perceived burdensomeness at baseline, revealing no significant association with daily level of suicidal urge intensity (Al-Dajani & Czyz, 2022).

IPs associated with suicidal behaviours. Of the studies reviewed, four studies focused on between-person prospective associations between IPs and suicidal behaviours across the ESM period (Czyz et al., 2021; Kim et al., 2023; Parrish et al., 2021). All four of these studies have investigated how history of suicidal behaviours, measured at baseline, are associated with IPs in daily life. Each specific IP was, however, only examined by one study, leaving the evidence base poorly substantiated. Findings from these studies suggest that history of suicidal behaviours does not predict how IPs are experienced in daily life.

IPs associated with NSSI thoughts/urges. Two studies investigated associations between IPs and NSSI thoughts (Christensen et al., 2023; Franssens et al., 2023), suggesting that individuals who perceive less emotional social support (Christensen et al., 2023), and more interpersonal distrust and rejection (Franssens et al., 2023) in everyday life are the ones most likely to also experience NSSI thoughts in daily life. Importantly, however, these studies also revealed that perceived emotional social support (Christensen et al., 2023) and insecure attachment assessed at baseline (Franssens et al., 2023) are not prospectively associated with an increased risk for NSSI thoughts in daily life.

IPs associated with NSSI behaviour. Eight studies investigated between-person associations of IPs and NSSI (Berghoff et al., 2022; Christensen et al., 2023; Czyz, Glenn, et al., 2019; Dodd et al., 2022; Koenig et al., 2021;Santangelo et al., 2017; Schwartz-Mette et al., 2023; Turner et al., 2017). Both cross-sectional and prospective All three types of study designs were adopted, which provided three novel insights (Table 4). First, engaging in NSSI does not seem to be cross-sectionally associated with relying on support (Czyz, Glenn, et al., 2019) or

Table 4
Main findings of ESM studies.

Reference	Area of Investigation (association in daily life, variability, transition)	Level of Analysis	Time Scale	Main Findings
Al-Dajani and Czyz (2022)	Association in daily life	Between- and within-person level (contemporaneous and temporal)	Same day Next day	1. Greater belongingness (family or peer) attenuated the adverse impact of PB on same-day suicidal urge intensity but not next-day suicidal urge intensity. 2. Higher previous-day PB, but not belongingness (family or peer), predicted next-day suicidal urge intensity. 3. Baseline PB, but not the interaction of TB and PB, predicted daily level of suicidal urge intensity.
Al-Dajani et al. (2022)	Association in daily life	Between- and within-person level (temporal)	Next day	1. Reaching out to professional support, but not personal support, the previous day was associated with lower next-day suicidal urge intensity (within-person level). 2. Reaching out to personal support, but not professional support, was associated with lower daily suicidal urge intensity (between-person level).
Ammerman and Jacobucci (2023)	Association in daily life	Within-person level (temporal)	Next time point	1. Absence of social contact was prospectively associated with next timepoint active and passive SI. The effect for passive SI was slightly stronger. 2. The presence of social conflict and higher quality/quantity social interactions were not prospectively associated with next timepoint SI.
Berghoff et al. (2022)	Association in daily life	Between-person level	N/A	1. No group differences in interpersonal experiences between individuals with and without NSSI. 2. Negative interpersonal experiences were significantly more likely before a stressful event for individuals with NSSI than those without NSSI.
Botelho et al. (2023)	Association in daily life	Within-person (contemporaneous and temporal)	Same day Next day	1. Discrimination and rejection (as one construct) predicted same-day acquired capability for suicide. 2. Violence did not predict same-day acquired capability for suicide. 3. Discrimination, rejection, and violence did not predict next-day acquired capability for suicide.
Brown et al. (2023)	Association in daily life	Within-person level (temporal)	Next time point	1. Unfavourable social comparisons, loneliness and barriers to seeking support were significantly associated with SI severity at the previous and next time point. 2. Support-seeking frequency was associated with SI severity at the previous, but not at the next time point.
Christensen et al. (2023) USA	Association in daily life	Between-person level		1. Baseline perceived emotional social support is not associated with NSSI urges or behaviours in daily life. 2. Perceived emotional social support in daily life is associated with NSSI urges and behaviours in daily life.
Coppersmith et al. (2019)	Association in daily life	Within-person level (contemporaneous and temporal)	Same day	1. Social support was negatively associated with same-day and next-day SI but not with daily changes in SI. 2. TB and PB are positively associated with same-day SI. 3. TB, but not PB, is positively associated with next-day SI.
Czyz, Horwitz, et al. (2019)	Association in daily life	Within-person level (contemporaneous and temporal)	Same day Next day	1. Connectedness was negatively associated with same-day SI but not next-day SI. 2. Burdensomeness was positively associated with same-day SI, but not next-day SI. 3. Combination 'connectedness-burdensomeness' was negatively associated with frequency, duration, and urge severity of same-day SI and next-day SI. 4. High burdensomeness and high connectedness were associated with a decrease in same-day and next-day SI.
Czyz, Glenn, et al. (2019)	Association in daily life	Between- and within-person level (contemporaneous)		Relying on support from others was not significantly associated with NSSI behaviour (at either the between- and within-person level).
Czyz et al. (2021)	Association in daily life	Between-person level	N/A	Connectedness and burdensomeness were not associated with the occurrence of a suicidal crisis 14 days later.
Defayette et al. (2023)	Association in daily life	Between- and within-person level (contemporaneous and temporal)	Next time point	1. The number of negative peer events was not associated with the likelihood of presence versus absence of SI at the same or the next time point. There were also no significant between-subject findings. 2. Within-person association between exclusion severity and SI intensity was marginally significant at the same time point, but not significant at the next time point. 3. Between-person association between exclusion severity and SI intensity was not significant at the same or the next time point.
Depp et al. (2016)	Association in daily life	Between-person level	N/A	1. Individuals with SI were approximately 50% more likely to predict being alone (social interaction appraisal) in the near future. 2. Individuals with SI endorsed more negative appraisals toward recent social interactions.

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Table 4 (*continued*)

Reference	Area of Investigation (association in daily life, variability, transition)	Level of Analysis	Time Scale	Main Findings
				3. SI was not associated with the quantity of social interactions or the time spent alone.
Dodd et al. (2022)	Association in daily life	Between-person level	N/A	Interpersonal problems were not associated with subsequent NSSI behaviours.
Franssens et al. (2023) Belgium	Association in daily life	Between- and within-person level (contemporaneous)	Same day	1. Interpersonal distrust and rejection sensitivity were significantly positively related to daily NSSI thoughts at the between- and within-person level. 2. Insecure attachment was not associated with daily NSSI thoughts at the between-person level.
Gerner, Moscardini, Mitchell, Hill, & Tucker (2023)	Association in daily life	Within-person (contemporaneous and temporal)	Next time point	1. Significant concurrent associations between interpersonal hopelessness about TB and about PB, and suicidal desire. 2. Significant concurrent association between the interaction of interpersonal hopelessness about TB and PB, and suicidal desire. 3. Significant prospective associations between interpersonal hopelessness about TB and about PB, and suicidal desire. 4. Suicidal desire was not predictive for interpersonal hopelessness about TB and about PB, or their interaction.
Glenn et al. (2022)	Association in daily life	Within-person level (temporal)	Next day	1. Negative life events were significantly related to next-day SI. 2. Friend TB and family TB were related to next-day SI. 3. TB with family mediated the link between negative life events and next-day SI, while TB with friends did not mediate the association between negative life events and next-day SI.
Hadzic et al. (2020)	Association in daily life	Between-person level	N/A	PB, but not TB, was positively associated with suicidality at baseline and SI (both at baseline and in daily life).
Haliczer and Dixon-Gordon (2023)	Association in daily life	Between- and within-person level	Same day	1. Individuals with NSSI reported more stressful social interactions characterized by significantly greater distress, conflict, and confusion. 2. Level of distress and confusion characterizing social stressors was associated with an increase in the likelihood of a same-day NSSI urge. 3. The level of conflict characterizing social stressors was not associated with an increase in the likelihood of a same-day NSSI urge. 4. Level of distress and conflict characterizing social stressors was associated with an increase in the likelihood of same-day NSSI behaviour. 5. Level of confusion characterizing social stressors was not associated with an increase in the likelihood of a same-day NSSI behaviour.
Hallensleben et al. (2019)	Association in daily life	Within-person level (contemporaneous and temporal)	Next time point	1. TB and PB was positively associated with concurrent passive SI. 2. PB, but not TB, was positively associated with next time point passive SI. 3. TB and PB were both positively associated with concurrent active SI. 4. PB and the interaction between TB and PB, but not TB, predicted active SI.
Halverson et al. (2023)	Association in daily life	Within-person level (contemporaneous and temporal)	Next time point	1. Interpersonal stressors preceded and predicted NSSI urges but not NSSI behaviour. 2. Higher levels of interpersonal distress preceded and predicted both NSSI urges and NSSI behaviour.
Hamilton et al. (2024) USA	Association in daily life	Within-person level (contemporaneous)	Same day	1. Higher levels of social comparison on social media were associated with SI in daily life. 2. Higher levels of feeling supported or connected on social media were associated with SI in daily life.
Hepp, Carpenter, et al. (2021)	Association in daily life	Within-person level (contemporaneous and temporal)	Next time point Same day Next day	1. The sum of negative interpersonal events was positively associated with concurrent NSSI urges, but not subsequent urges. 2. Degree of distress from negative interpersonal events was positively associated with concurrent urges, but not subsequent urges. 3. A higher number of negative interpersonal events predicted a high probability of concurrent but not next time point NSSI behaviour. 4. Higher distress from negative interpersonal events was associated with same and next time point NSSI behaviour. 5. NSSI behaviour was not significantly associated with the number of negative/positive interpersonal events nor their distress at the next time point. 6. Negative interpersonal events were positively associated with same-day NSSI behaviour. 7. NSSI behaviour was positively associated with the average number of negative interpersonal events on the same-day, but not the next-day.

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Table 4 (*continued*)

Reference	Area of Investigation (association in daily life, variability, transition)	Level of Analysis	Time Scale	Main Findings
				8. No significant associations between NSSI behaviour and positive interpersonal events on the same day or next day.
Hepp, Störkel, et al. (2021)	Association in daily life	Within-person level (contemporaneous)	Same day	1. NSSI urges were associated with feeling rejected within the same day. 2. No associations were found between socializing and NSSI urges or between interaction partners and NSSI urges.
Hutchinson et al. (2021)	Association in daily life	Between-person level	N/A	Both greater peer connectedness and neural activation to anticipated social reward (i.e., positive peer feedback) are associated with reduced likelihood of reporting SI during the initial stay-at-home orders of the Covid-19 pandemic.
Husky et al. (2017)	Association in daily life	Within-person level (temporal)	Next time point	1. Socializing was not significantly associated with next time point SI. 2. Greater likelihood of subsequent SI when being alone or having negative family events. 3. No significant associations between having friends or partner events and subsequent SI.
Jacobucci et al. (2023)	Association in daily life	Within-person level (temporal)	Next time point	Both PB and TB were associated with next timepoint SI.
Janssens et al. (2023)	Association in daily life	Between-person level	N/A	1. Both paternal and maternal attachment insecurity were significantly associated with current self-harm thoughts but not current self-harm behaviours. 2. No significant associations were found between peer attachment insecurity and current self-harm thoughts or behaviours.
Janssens, Lafit, De Corte, et al. (2023) Belgium	Association in daily life	Within-person level (temporal)	Next time point/ window	1. Loneliness was significantly associated with the presence and intensity of self-harm thoughts within the next 90-min time interval. This association was moderated by maternal attachment relationship quality. 2. Engaging in self-harm behaviours was significantly associated with a stronger decrease in loneliness within that same 90-min time interval. This association was moderated by paternal attachment relationship quality.
Janssens, Lafit, Simsa, et al. (2023) Belgium	Association in daily life	Between-person level		Higher levels of maternal, but not paternal or peer, attachment relationship quality buffered the association between adverse childhood experiences and the intensity of current self-harm thoughts.
Kaurin et al. (2022)	Association in daily life	Between- and within-person level	N/A	1. Perceived coldness (interpersonal experience) and perceiving interaction partners as more dominant was positively associated with SI at the between-person, but not at the within-person, level.
Kleiman et al. (2017)	Association in daily life	Within-person level (contemporaneous and temporal)	Next time point	Study 1: 1. TB and PB were positively associated with SI at the same time point 2. PB, but not TB, predicted SI at the next time point (but not when accounting for the lagged autoregressive effect of SI) Study 2: TB was positively associated with SI at the same but not the next time point.
Koenig et al. (2021)	Association in daily life	Between- and within-person level (temporal)	Following hour	1. Feelings of attachment toward the mother were associated with a lower likelihood of NSSI behaviour at the between-, but not within-, person level 2. Feelings of attachment toward best friend were associated with a lower likelihood of NSSI behaviour at the within-, but not between-, person level and these feelings decreased the hour after NSSI behaviour
Kim et al. (2023)	Association in daily life and variability	Between-person level	N/A	1. A suicide attempt characterized subtype showed significantly higher scores in anger toward others, feelings of rejection, and loneliness when compared to a cutting and scratching subtype. 2. The degree of changes in anger toward others, but not the degree of change in feelings of rejection or loneliness, was greater in the suicide attempt subtype than that of the cutting and scratching subtype.
Kyron et al. (2023)	Association in daily life	Within-person level (contemporaneous and temporal)	Same day Next day	PB and TB were not significantly associated with same-day or next-day NSSI behaviour.
MacNeil et al. (2023)	Association in daily life	Between-person level	N/A	PB, loneliness, and negative social interactions were higher in adolescents who are at higher risk for SI compared to those at lower risk for SI.
Mereish, Peters, Brick, Killam, & Yen (2023)	Association in daily life	Between- and within-person level (contemporaneous)	Same day	Daily external/internal minority stress was associated with higher daily SI and NSSI ideation intensity, at both the between- and within-person level.
Mou et al. (2018)	Association in daily life	Within-person level (temporal)	Next time point	Loneliness predicted SI.
Mournet et al. (2022)	Association in daily life	Within-person level (contemporaneous and temporal)	Same day Next day	1. Seeking support, loneliness, and burdensomeness, and the interaction between seeking support and burdensomeness were contemporaneously associated with SI.

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Table 4 (*continued*)

Reference	Area of Investigation (association in daily life, variability, transition)	Level of Analysis	Time Scale	Main Findings
				2. The interaction between seeking support and loneliness was not significantly associated with same-day SI. 3. Burdensomeness and loneliness, but not seeking support, were prospectively associated with next-day SI. 4. No significant interaction effect between support seeking and loneliness on same-day or next-day SI.
Nock, Borges, Bromet, Alonso, et al. (2008)	Association in daily life	Within-person level (contemporaneous and temporal)	Same time point	1. The social context and being alone was associated with NSSI thoughts and SI. 2. Socializing was not a significant predictor for NSSI behaviour. 3. Being alone, but not having an argument with someone, was a predictor of NSSI behaviour. 4. SI was associated with having an argument with someone (social context). 5. Talking to someone was one of the most commonly used alternative behaviours (social context). 6. The likelihood of NSSI behaviours increased when feeling rejected and anger toward another (social context). 7. Feelings of rejection (social context) were retrospectively more frequently reported for NSSI behaviours (34.0%) than NSSI thoughts (15.0%).
Oppenheimer et al. (2020)	Association in daily life	Between-person level	N/A	Negative social experiences moderate the association between the neural response of social rejection and SI severity.
Parrish et al. (2021)	Association in daily life	Between-person level	N/A	1. Participants with SI had higher PB and TB than participants without SI. 2. SI status was related to more TB. 3. PB and TB did not differ between participants based on past suicide attempts.
Parrish et al. (2021)	Association in daily life	Between-person level	N/A	1. Higher severity of SI in the past 48 h, negatively correlated with higher mean social approach and lower mean social avoidance motivation. 2. Social approach and avoidance motivations did not differ between participants who did and did have a history of suicide attempts, and were not significantly correlated with the number of lifetime suicide attempts.
Peters et al. (2022)	Variability	Within-person level	N/A	SI instability was positively correlated with social connection instability.
Rath et al. (2019)	Association in daily life	Within-person level (contemporaneous)	Next time point	PB and TB were concurrently but not temporally associated with SI.
Rogers (2023)	Association in daily life	Within-person level (contemporaneous and temporal)	Next time point Two hours later	PB and TB were concurrently but not prospectively associated with SB at the prompt level.
Ruork et al. (2022)	Association in daily life	Within-person		Social invalidation was significantly associated with NSSI urges but not suicide urges.
Santangelo et al. (2017)	Association in daily life	Between-person level	N/A	NSSI behaviour was associated with lower levels of attachment to the mother and to a best friend and greater instability in attachment.
Schwartz-Mette et al. (2023)	Association in daily life	Between-person level	N/A	COVID-19 loneliness predicted higher NSSI frequency for adolescents with low pre-pandemic frequency (but less frequent NSSI behaviour for adolescents with high pre-pandemic frequency) and higher suicide risk for adolescents with higher pre-pandemic risk.
Sels et al. (2022)	Association in daily life	Within-person level (temporal)	Next time point	1. Perceived responsiveness was negatively associated with next time point SI. 2. Both PB and TB significantly predicted SI. 3. Significant interaction effect between PB and perceived responsiveness and between TB and perceived responsiveness on SI at the next time point.
Shingleton et al. (2013)	Association in daily life	Within-person level (contemporaneous)	Same time point	NSSI thoughts were most of the time when alone, seldom when with family, and rarely because of peer pressure.
Smith et al. (2024) USA	Association in daily life	Between- and within-person level (contemporaneous and temporal)	Within seconds and across 3–4 h	1. TB, and not PB, was associated with SI at the between-person level. 2. PB was contemporaneously associated with SI. 3. PB was temporally associated with passive SI.
Stanley et al. (2021)	Association in daily life	Between- and within-person level (contemporaneous)	Next time point	Socializing was associated with SI at the between- and within-person level.
Turner et al. (2019)	Association in daily life	Within-person level (contemporaneous and temporal)	Same day	1. Perceived support was retrospectively associated with less intense NSSI urges within the same day. 2. Perceived support was associated with less intense same-day NSSI urges, but also less success resisting these urges.
Turner, Cobb, et al. (2016)	Association in daily life	Within-person level (contemporaneous and temporal)	Same day Next day	1. Perceived social support following disclosed NSSI behaviour was positively associated with next-day NSSI urges and a greater likelihood of next-day NSSI behaviour. 2. Perceived social support following undisclosed NSSI behaviour was negatively associated with next-day NSSI urges.

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Table 4 (*continued*)

Reference	Area of Investigation (association in daily life, variability, transition)	Level of Analysis	Time Scale	Main Findings
				3. Those who reveal at least one act of NSSI showed a significant relationship between perceived support and next-day NSSI behaviour 4. Participants who had revealed at least one act of NSSI reported more frequent NSSI. 5. Interpersonal conflict was positively associated with same-day NSSI urges and the likelihood of engaging in NSSI. 6. NSSI behaviour that were revealed to others were followed by increased perceived social support the next day (versus behaviours that were not). 7. NSSI behaviours were not significantly associated with changes in interpersonal conflict the following day, regardless of whether they were revealed.
Turner et al. (2017)	Association in daily life	Between-person level	N/A	1. Individuals with NSSI behaviour had less frequent contact with family members and peers, but more frequent contact with romantic partners 2. Individuals with NSSI behaviour reported less perceived support during and following interactions with peers, but did not differ from Individuals without NSSI behaviour in their rating of support received from romantic partners or family members. 3. Individuals with NSSI behaviour were significantly less likely to use support seeking to cope with distress than Individuals without NSSI behaviour.
Turner, Yiu, et al. (2016)	Association in daily life	Within-person level (contemporaneous)		1. NSSI thoughts were associated with arguments or conflict with others, being isolated or alone, and someone being disappointed (stressors). 2. Greater likelihood to act on NSSI thoughts following arguments and feelings of rejection. 3. Socializing was not one of the main activities reported when NSSI behaviour occurred
Victor et al. (2019)	Association in daily life	Within-person level (temporal)	Next time point	1. Rejection and criticism (interpersonal experiences) were associated with a greater likelihood of subsequent NSSI urges and suicide urges.

Note. ESM = Experience Sampling Method, NSSI = Non-Suicidal Self-Injury, SI = Suicidal Ideation, SB = Suicidal behaviour, TB = Thwarted Belongingness, PB = Perceived Burdensomeness, N/A = Not Applicable.

feelings of attachment toward a best friend (Koenig et al., 2021) across the ESM period. However, NSSI was cross-sectionally related to feelings of attachment toward mother across the monitoring period (Koenig et al., 2021).

Second, based on findings from three prospective studies (Santangelo et al., 2017; Schwartz-Mette et al., 2023; Turner et al., 2017), we can conclude that individuals who report more frequently engaging in NSSI behaviours at baseline show greater instability in their attachment levels, are less securely attached to their mother and best friend (Santangelo et al., 2017) and felt more lonely during COVID-19 (Schwartz-Mette et al., 2023). Individuals that report (more) NSSI behaviours at baseline seem to be less frequently in contact with their family/peers and are less likely to seek support to cope with distress and perceive support from peers during their everyday life (Turner et al., 2017).

Third, findings from two prospective studies allow us to understand how between-person differences in IPs at baseline may increase the risk for NSSI behaviours in daily life. These studies suggest that differences in perceived emotional support (Christensen et al., 2023) and interpersonal problems (Dodd et al., 2022) at baseline are not associated with increased risk for NSSI behaviours in daily life.

IPs associated with self-harm thoughts. Two studies investigated between-person associations of attachment (relationship quality) and self-harm thoughts, irrespective of intent (Janssens et al., 2023; Janssens, Lafit, Simsa, et al., 2023). These prospective studies suggest that individuals with higher levels of paternal and maternal attachment insecurity are more likely to think about self-harm in their daily lives (Janssens et al., 2023), whilst the other study shows that maternal attachment relationship quality is a protective factor that can buffer the negative effect of adverse childhood experiences on the intensity of self-harm thoughts in daily life (Janssens, Lafit, Simsa, et al., 2023).

3. How are differences in IPs *within* individuals associated with SITBs?

IPs associated with suicidal thoughts/urges. Of the studies reviewed, 21 studies focused on within-person relationships between a specific IP and suicidal self-injurious thoughts (Al-Dajani et al., 2022; Al-Dajani & Czyz, 2022; Ammerman & Jacobucci, 2023; Brown et al., 2023; Coppersmith et al., 2019; Czyz, Horwitz, et al., 2019; Defayette et al., 2023; Glenn et al., 2022; Hallensleben et al., 2019; Hamilton et al., 2024; Husky et al., 2017; Jacobucci et al., 2023; Kleiman et al., 2017; Mou et al., 2018; Mournet et al., 2022; Nock et al., 2009; Rath et al., 2019; Sels et al., 2022; Smith et al., 2024; Stanley et al., 2021; Victor et al., 2019). Twelve studies have investigated contemporaneous (concurrent) associations between an IP and suicidal thoughts/urges (Al-Dajani & Czyz, 2022; Coppersmith et al., 2019; Czyz, Horwitz, et al., 2019; Defayette et al., 2023; Hallensleben et al., 2019; Hamilton et al., 2024; Kleiman et al., 2017; Mournet et al., 2022; Nock et al., 2009; Rath et al., 2019; Smith et al., 2024; Stanley et al., 2021). Based on these studies, we can conclude that belongingness (Al-Dajani & Czyz, 2022; Coppersmith et al., 2019; Hallensleben et al., 2019; Kleiman et al., 2017; Rath et al., 2019), burdensomeness (Coppersmith et al., 2019; Czyz, Horwitz, et al., 2019; Hallensleben et al., 2019; Kleiman et al., 2017; Mournet et al., 2022; Rath et al., 2019; Smith et al., 2024), support (Hamilton et al., 2024; Mournet et al., 2022), loneliness (Mou et al., 2018; Mournet et al., 2022) and connectedness (Czyz, Horwitz, et al., 2019; Hamilton et al., 2024) are contemporaneously related to suicidal thoughts/urges within the same assessment period (Table 4).

Eighteen studies have investigated temporal within-person associations between an IP and suicidal thoughts/urges (Al-Dajani et al., 2022; Al-Dajani & Czyz, 2022; Ammerman & Jacobucci, 2023; Brown et al.,

2023; Coppersmith et al., 2019; Czyz, Horwitz, et al., 2019; Defayette et al., 2023; Glenn et al., 2022; Hallensleben et al., 2019; Husky et al., 2017; Jacobucci et al., 2023; Kleiman et al., 2017; Mou et al., 2018; Mournet et al., 2022; Nock et al., 2009; Sels et al., 2022; Smith et al., 2024; Victor et al., 2019). Whilst we find no convergent evidence for a prospective association between higher-than-usual perceived burdensomeness and the intensity of suicidal thoughts/urges (Al-Dajani & Czyz, 2022; Coppersmith et al., 2019; Czyz, Horwitz, et al., 2019; Glenn et al., 2022; Hallensleben et al., 2019; Jacobucci et al., 2023; Kleiman et al., 2017; Mournet et al., 2022; Rath et al., 2019; Smith et al., 2024), we do find evidence for a prospective effect of the interaction between perceived burdensomeness and thwarted belongingness on suicidal thoughts/urges (Al-Dajani & Czyz, 2022). This interaction effect suggests that when people experience momentary elevated levels on both perceived burdensomeness and thwarted belongingness, there is an increased risk for experiencing suicidal thoughts/urges. Of note, this effect seemed to play out across hours rather than days as it was only found for suicidal thoughts at the next time point on average 1–2 h later (Hallensleben et al., 2019) and not the next day (Al-Dajani & Czyz, 2022). It should be mentioned, however, that these studies did not control for the self-predictive effect of suicidal thoughts over time (i.e., the autoregressive effect), leaving it uncertain whether the interaction of these IPs uniquely increases risk.

In fact, to date, only three studies have controlled for autoregressive effects which enables the reliable identification of IPs that incrementally predict suicidal thoughts/urges (Coppersmith et al., 2019; Jacobucci et al., 2023; Sels et al., 2022). These studies found evidence for a predictive effect of thwarted belongingness on suicidal thoughts, but only when more dense sampling schedules were used (e.g., at least 4 assessments daily; Jacobucci et al., 2023; Sels et al., 2022), thereby suggesting that the time scale on which these IPs operate in predicting suicidal thoughts operates is more likely to occur across hours rather than days (Table 4).

IPs associated with suicidal behaviours. One study has investigated within-person associations between IPs and suicidal behaviour, and found that both thwarted belongingness and burdensomeness were concurrently, but not prospectively, associated with suicidal behaviour across two hours (Rogers, 2023).

IPs associated with NSSI thoughts/urges. Eight studies investigated temporal within-person associations of IPs and NSSI thoughts/urges (Franssens et al., 2023; Haliczer & Dixon-Gordon, 2023; Hepp, Störkel, et al., 2021; Shingleton et al., 2013; Turner et al., 2019; Turner, Cobb, et al., 2016; Turner, Yiu, et al., 2016; Victor et al., 2019), suggesting that being alone (Shingleton et al., 2013; Turner, Yiu, et al., 2016), rejection (Franssens et al., 2023; Hepp, Störkel, et al., 2021), interpersonal distrust (Franssens et al., 2023) and perceived social support (Turner et al., 2019) are contemporaneously associated with daily-life NSSI thoughts/urges.

Additionally, conflict (Turner, Cobb, et al., 2016/b), rejection (Victor et al., 2019) and perceived social support (Turner, Cobb, et al., 2016) have been found to prospectively predict NSSI thoughts/urges in real time. However, one study suggests that the nature of this relationship might be dependent on whether they disclosed their NSSI behaviour, such that when individuals disclosed their NSSI behaviour, the perceived social support that followed was positively associated with next-day urges (Turner et al., 2019).

IPs associated with NSSI behaviours. Five studies investigated within-person associations of a specific IP and engagement in NSSI behaviour (Haliczer & Dixon-Gordon, 2023; Kyron et al., 2023; Nock et al., 2009; Turner, Cobb, et al., 2016; Turner, Yiu, et al., 2016), indicating that both conflict (Haliczer & Dixon-Gordon, 2023; Turner, Cobb, et al., 2016) and rejection (Nock et al., 2009; Turner, Yiu, et al., 2016) are prospectively associated with the presence of NSSI behaviours at the next assessment point.

4. **Do IPs in daily life differentially relate to self-injurious thoughts rather than behaviours in real-time?**

IPs associated with suicidal thoughts/urges and behaviours. Of all studies that investigated both IPs and SITBs in daily life, five studies included both suicidal thoughts/urges and behaviours (Defayette et al., 2023; Janssens, Lafit, De Corte, et al., 2023; Mereish, Peters, Brick, Killam, & Yen, 2023; Nock et al., 2009; Shingleton et al., 2013), but none of these studies investigated whether an IP relates differently to suicidal thoughts, behaviours, or the transition from suicidal thoughts to behaviours.

IPs associated with NSSI thoughts/urges and behaviours. Of all studies that investigated both IPs and SITBs in daily life, twelve studies included both NSSI thoughts/urges and behaviours (Christensen et al., 2023; Czyz, Glenn, et al., 2019; Haliczer & Dixon-Gordon, 2023; Halverson et al., 2023; Hepp, Carpenter, et al., 2021; Janssens, Lafit, De Corte, et al., 2023; Koenig et al., 2021; Mereish, Peters, Brick, Killam, & Yen, 2023; Nock et al., 2009; Shingleton et al., 2013; Turner et al., 2019; Turner, Cobb, et al., 2016). Three of these studies investigated whether an IP is associated with NSSI thoughts/urges, behaviours or both (Christensen et al., 2023;Halverson et al., 2023; Hepp, Carpenter, et al., 2021). One study suggests that perceived emotional support is associated with both NSSI urges and behaviours (Christensen et al., 2023). However, evidence regarding the role of interpersonal stress in NSSI urges versus behaviours is mixed (Halverson et al., 2023; Hepp, Carpenter, et al., 2021).

Three studies investigated IPs that are related to the transition from NSSI thoughts/urges to behaviours (Nock et al., 2009; Turner et al., 2019; Turner, Yiu, et al., 2016). Social rejection (Nock et al., 2009), being alone (Nock et al., 2009; Turner et al., 2019), and having an argument or conflict with someone (Turner, Yiu, et al., 2016) were with retrospective assessments associated with acting upon self-injurious thoughts. Another study showed that greater perceived support was associated with a lower likelihood of resisting engaging in NSSI behaviour when intense same-day NSSI urges were experienced (Turner et al., 2019). Finally, one study found that talking to someone was one of the most commonly used alternative behaviours (Nock et al., 2009). Yet, none of these studies have controlled for NSSI thoughts/urges in the prediction of NSSI behaviours which could explain findings by their association with NSSI thoughts/urges.

4. Discussion

4.1. General summary of study findings

This review identified 58 ESM studies that assessed IPs and/or SITBs These studies were conducted in the USA ($n = 36$), Europe ($n = 11$), and Canada ($n = 6$), and represent data from 49 unique samples. Most studies did not investigate primary IPs from major theoretical models, with the measurement of IPs being highly heterogeneous. The findings indicate that perceived burdensomeness is positively related to SITBs at the between- and within-person level. However, based on the current literature, no firm conclusions can be made regarding the timescale on which IPs operate (minutes, hours, days). Moreover, the findings from studies investigating other IPs remain ambiguous due to the highly diverse ways in which constructs are operationalized. In light of these challenges, more research is necessary to clarify whether variations in IPs are linked to SITBs and to identify whether specific IPs are associated with the emergence of self-injurious thoughts and the subsequent progression to behaviour in real-time. In the subsequent sections, we discuss the implications of the findings for each question addressed in this review.

4.2. Assessment of IPs (RQ 1)

Whilst ESM provides the necessary temporal precision and ecological

validity to reliably test the dynamic IPs from contemporary models on SITBs, only 18 out of 58 studies have investigated tenets of the three primary IPs from major theoretical models (i.e., connectedness, belongingness and perceived burdensomeness). In total, over 50 other IPs were investigated, highlighting a proliferation of investigated constructs. Moreover, the assessment of IPs in ESM studies of SITBs was highly heterogeneous, resulting in a fragmented literature. For example, perceived burdensomeness was operationalized in 10 different ways (see Table 3). However, as only 53.45% of the included studies have reported the full text of their items (Table 2), we cannot ascertain the exact degree of inconsistency in ESM measurement. In addition, some constructs measured with similar ESM items were considered different between studies, and similar constructs were assessed with a variety of items, referred to as "jingle" and "jangle" fallacies (Gonzalez et al., 2021), respectively. While measurement issues occur across psychological research (Flake & Fried, 2020), they are especially common in ESM research due to single-item measures and the accompanying challenges of psychometrically validating them (Fritz et al., 2023). These measurement issues hamper comparison across studies, and may create an illusion of broader support and convergent evidence for an association between a given IP and SITBs, while in fact the evidence is highly heterogeneous and fragmented.

Future research would benefit from transparently reporting measurement details and finding consistency in defining constructs and their operationalizations (e.g., item wording, timeframe, and response options). For guidance about transparent reporting of ESM items, we direct readers to Trull & Ebner-Priemer, 2020 and Flake & Fried, 2020. Open science practices, such as pre- and post-registration and open materials —increasingly used in ESM (Kirtley et al., 2021), clinical psychology (Dora et al., 2023; Tackett et al., 2017; Tackett et al., 2019), and suicide research (Kirtley, Janssens, & Kaurin, 2022) — offer opportunities for increasing measurement transparency and replicability in ESM research on IPs and SITBs. One open science measurement initiative, the ESM Item Repository (Kirtley et al., 2024; www.esmitemrepository.com), enables researchers to contribute their ESM items to an open bank of items, increasing their discoverability and transparency.

Additionally, we believe the current literature would benefit from further defining and clarifying constructs and using standardized assessment methods. Although it may be valuable to use standardized, retrospective, self-report questionnaires — for example, the Interpersonal Needs Questionnaire (INQ), which is used to assess IPs with reasonable reliability (Hill et al., 2015; Mitchell et al., 2020; Van Orden et al., 2012) — as a basis for developing ESM items, such questionnaire items are not always directly portable to the ESM context (Eisele et al., 2021). We encourage researchers and funders to prioritize studies that develop validated ESM items to assess certain IPs and SITBs. This could lead to a set of gold standard ESM items per construct, which facilitates comparison across studies, scientific communication between researchers, and the building of a cumulative evidence base. Some researchers have begun this crucial work by developing ESM items to assess SI, thwarted belongingness, and perceived burdensomeness (Forkmann et al., 2018). However, specific ESM items to assess a broad range of IPs and SITBs have yet to be developed and validated.

4.3. Between-person relationships (RQ2)

All four studies investigating the association between perceived burdensomeness and SITBs suggest an association with self-injurious thoughts so that individuals with (higher levels of) suicidal thoughts/urges, reported higher levels of perceived burdensomeness (Al-Dajani & Czyz, 2022; Hadzic et al., 2020; MacNeil et al., 2023; Parrish et al., 2021). However, the extent to which the level of connectedness or belongingness — two other prominent IPs in theoretical models — are related to SITBs remains unclear, as the reviewed studies reported divergent results at the between-person level (Czyz et al., 2021; Hadzic et al., 2020; Hutchinson et al., 2021; Parrish et al., 2021; Smith et al., 2024). While emerging evidence among adolescent inpatients suggests that greater belongingness (family or peer) attenuates the adverse impact of perceived burdensomeness on same-day suicidal urge intensity (Al-Dajani & Czyz, 2022), more work is needed to evaluate this interaction in relation to SITBs as this is considered a key component in the process of developing self-injurious thoughts according to the Interpersonal Theory of Suicide (Joiner, 2005).

The evidence regarding between-person associations of social support and SITBs remains ambiguous (Al-Dajani et al., 2022; Christensen et al., 2023; Czyz, Glenn, et al., 2019; Turner et al., 2017). Given that social support is posited as a motivational moderator within the Integrated Motivation-Volitional model of SITBs (O'Connor & Kirtley, 2018), more work investigating relationships between social support and SITBs at the between-person level would be theoretically valuable. Regarding associations between attachment and SITBs, evidence suggests that individuals with higher attachment quality are less likely to report engaging in SITBs (Janssens et al., 2023; Janssens, Lafit, De Corte, et al., 2023; Janssens, Lafit, Simsa, et al., 2023; Koenig et al., 2021; Santangelo et al., 2017). However, more research is needed that resolves conflicting findings and further explores associations between IPs and SITBs.

Although we find evidence that IPs play a role in the manifestation of NSSI thoughts/urges and behaviours in daily life (Four-Function Model of NSSI, Benefits and Barriers Model and the Family Distress Cascade Theory; Bentley et al., 2014; Hooley & Franklin, 2017; Waals et al., 2018), current NSSI theories do not differentiate between thoughts and behaviours. This hinders the evaluation of specific predictions for NSSI models, indicating a need for further theory development.

At this stage, ESM studies that investigate IPs across subgroups that are specifically vulnerable to SITBs are lacking. For example, individuals in specific developmental stages, socioeconomic groups, clinical settings, or marginalized populations (e.g., LGTBQIA+ or multiracial youth) are at a greater risk for SITBs and are especially vulnerable to certain negative IPs, e.g., rejection and limited social support (Plener et al., 2015; Wiglesworth et al., 2022). Indeed, the interpersonal shifts that occur during adolescence — a phase where SITBs peak (Gandhi et al., 2018; Hawton et al., 2012) — could contribute to the heightened vulnerability for SITBs. However, more research is needed that reveals between-subgroup differences in within-person IPs that play out in the everyday lives of adolescents, as this may provide the information required to tailor the prevention and management of SITBs to the specific needs of young individuals. Additionally, and consistent with SITB research more broadly (Franklin et al., 2017), the ESM evidence regarding the protective role effect of IPs on SITBs is still in its infancy and this area of research deserves further exploration, as this may open up novel directions for research and practice. While this review highlights the investigation of several protective IPs (e.g., social connectedness, belongingness, support), our understanding of the role of a broader array of IPs and their interplay with established risk factors for SITBs (e.g., increased distress; Kuehn et al., 2022) remains limited. Future research could extend our knowledge on how to mitigate the impact of certain risk factors, and potential novel IP as protective factors, are essential to target and promote in prevention and intervention efforts.

To fully harness the potential of ESM and take into account the dynamic nature of IPs and SITBs, we may need to focus on the examination of between-person/group differences in within-person associations and fluctuations. For example, it may be relevant to reveal the extent to which momentary fluctuations in thwarted belongingness are associated with within-person fluctuations in SITBs, and differ between people who do and do not engage in SITBs, or between subgroups of individuals who engage in SITBs. This would provide knowledge into how individual sociodemographic, psychosocial, and clinical variables (e.g., frequency and severity of SITBs) are related to the salience of particular within-person associations between IPs and SITBs.

4.4. Within-person relationships (RQ3)

Initial support was provided for a negative, contemporaneous, within-person association between connectedness and suicidal thoughts/urges (Czyz, Horwitz, et al., 2019; Hamilton et al., 2024). Additionally, convergent evidence revealed that thwarted belongingness was contemporaneously related to suicidal thoughts/urges (Coppersmith et al., 2019; Hallensleben et al., 2019; Kleiman et al., 2017; Rath et al., 2019), but evidence regarding the prospective effect of thwarted belongingness on suicidal thoughts/urges was mixed. Similarly, there is converging evidence regarding a contemporaneous association between burdensomeness and suicidal thoughts/urges (Coppersmith et al., 2019; Czyz, Horwitz, et al., 2019; Hallensleben et al., 2019; Kleiman et al., 2017; Mournet et al., 2022; Rath et al., 2019; Smith et al., 2024), but evidence for a prospective association was again inconclusive (Coppersmith et al., 2019; Czyz, Horwitz, et al., 2019; Hallensleben et al., 2019; Jacobucci et al., 2023; Mournet et al., 2022; Rath et al., 2019; Sels et al., 2022). Moreover, studies investigating the theoretically important interaction between perceived burdensomeness and thwarted belongingness revealed positive within-person associations with suicidal thoughts/urges (Hallensleben et al., 2019; Rath et al., 2019) and suicidal urge intensity (Al-Dajani & Czyz, 2022). Some evidence was found for the within-person relationships between social context, rejection, support, loneliness, and SITBs (Brown et al., 2023; Husky et al., 2017; Mou et al., 2018; Mournet et al., 2022; Nock et al., 2009; Shingleton et al., 2013; Turner, Yiu, et al., 2016). However, more research using homogeneous assessment methods is required before firm conclusions about specific relationships of IPs with SITBs in daily life can be made. Moreover, information about specific timeframes (i.e., minutes/h between ESM prompts) that were used to test these within-person associations is largely missing in the current literature. Yet, this is essential information for researchers to determine optimal ESM sampling schemes to capture relationships between IPs and SITBs, and for clinicians to know the relevant time window in which to intervene.

ESM studies have the unique potential to unravel the timescales at which within-person associations between IPs and SITBs occur and which IPs are related to the transition from thoughts to behaviours. This knowledge is fundamental to improving daily-life prevention and intervention. Therefore, it is crucial that researchers report the average time between assessments in future studies. This could reveal and further refine the predictive value of short-term interpersonal warning signals. However, it is possible that the typical sampling frequency of ESM studies is not dense enough to detect the underlying time dynamic of within-person associations. This may result in finding only contemporaneous associations, whilst another study with more assessments per day may reveal a temporal association (Epskamp et al., 2018). Indeed, our review shows that the full range of timeframes in which certain associations can exist has yet to be explored as most findings to date appear to come from associations within the same assessment window. Moreover, temporal models that control for autoregressive effects are required to reliably identify which IPs incrementally predict risk of thoughts, behaviours, and the transition from thoughts to behaviours. Therefore, future research could investigate associations between IPs and SITBs using varying sampling frequencies to provide knowledge about the time scale on which IPs affect SITBs in daily life. An example of this type of research from another field measured IPs, such as parent-adolescent conflict, over six different timescales (Bülow et al., 2023). Furthermore, ESM could not only shed light on interpersonal warning signals but also offer exciting opportunities to test the ecological validity of novel NSSI models (e.g., Benefits and Barriers Model and the Family Distress Cascade Theory; Hooley & Franklin, 2017; Waals et al., 2018).

At this point, ESM studies investigating both IPs and SITBs have mainly investigated associations at a between- or within-person level to increase understanding of who is most at risk for SITBs and when risk is increased. However, additional investigation of variability in IPs and SITBs could increase our understanding of how IPs fluctuate differently in the daily lives of individuals who do and do not engage in SITBs and/or between subgroups of SITBs. As a result, this may enable the identification of new intervention targets (e.g., distal or contextual factors that influence instability in interpersonal processes) that can help us move forward in preventing and managing SITBs.

4.5. Associations between IPs and self-injurious thoughts versus behaviours (RQ 4)

Given that ESM can generate insights beyond between-person associations of IPs and SITBs and increase our understanding of when individuals may translate their thoughts into behaviours, this methodology is especially suited to test current ideation-to-action theories. Three studies have investigated whether an IP relates to the transition from self-injurious thoughts to behaviours (Nock et al., 2009; Turner, Cobb, et al., 2016; Turner, Yiu, et al., 2016). However, all of these studies have investigated these associations retrospectively at the day (Turner et al., 2019; Turner, Cobb, et al., 2016; Turner, Yiu, et al., 2016) or beep level (Nock et al., 2009). Individuals were more likely to act upon their thoughts if they felt rejected (Nock et al., 2009), were alone (Nock et al., 2009; Turner et al., 2019) or had an argument or conflict with someone (Turner, Yiu, et al., 2016). Interestingly, individuals who felt supported were less likely to refrain from NSSI when they had experienced NSSI urges that same day (Turner et al., 2019). However, more research is needed that differentially investigates whether specific IPs are associated with self-injurious thoughts, behaviours, or both as this is crucial to prevention and treatment development. Therefore, we encourage future researchers to include both self-injurious thoughts and behaviours when investigating relevant associations with IPs.

Moreover, future research should consider using temporal models to reliably identify which IPs are associated with the transition from thoughts to behaviours. Studies could test ideation-to-action theories and the hypothesized pathways within these. For example, within the IMV model (O'Connor & Kirtley, 2018), it is hypothesized that feeling defeated results in feelings of entrapment which, in turn, leads to suicidal ideation. This central mediation pathway is moderated by specific dynamic processes, such as thwarted belongingness and perceived burdensomeness. An ESM study may empirically test these predictions by investigating the association between defeat, entrapment, and suicidal ideation over hours in real-time, and the extent to which thwarted belongingness and perceived burdensomeness influence the relationship between entrapment and suicidal ideation.

Yet, there are several challenges in setting up an ESM study to investigate key IPs and SITBs that warrant discussion. Decisions regarding the ESM protocol (i.e., timing and frequency of ESM prompts) should be made based on the estimated burden and feasibility of using ESM within the group of interest. For example, previous research by Kleiman et al. (2017) and Coppersmith et al. (2023) revealed that SITBs can vary greatly over the course of a day, and research by Turner et al. (2019) suggests that SITBs might be more endorsed during the evening. This encourages repeated assessment of SITBs throughout the day and evening. A combination with event-contingent sampling and burst ESM surveys — ESM prompts spaced at a higher frequency, such as when intense self-injurious thoughts/urges are experienced — could advance understanding of IPS related to the manifestation of intense thoughts and those related to the subsequent engagement in behaviour (e.g., Kiekens et al., 2023). Despite the often expressed concerns of ethics committees, previous research demonstrates that repeatedly asking about SITBs using ESM does not intensify self-harm thoughts or the risk of engaging in self-harm behaviours (Blades et al., 2018; Coppersmith, Dempsey, et al., 2022). However, adolescents reporting SITBs during an ESM period are more likely to report ESM beep-disturbance, i.e., a sense of being disrupted/inconvenienced by the ESM questionnaires, than those not reporting SITBs during the ESM period, and at moments when adolescents' self-harm thoughts were more vs. less intense, they also

reported higher beep-disturbance (Kirtley et al., 2023). Consequently, researchers must take active steps to minimize unnecessary burden, such as curtailing questionnaire length — as increased burden is associated with the length of the ESM questionnaire, not with increased sampling frequency (Eisele et al., 2021).

In addition to this, assessing specific IPs and SITBs in daily life can be challenging as both can be rare, e.g., interpersonal conflict and suicide attempts. The low prevalence of events can reduce the statistical power of studies, necessitating either larger datasets (with more participants, more observations, or longer ESM assessment periods) to reliably establish associations. However, research in clinical samples (e.g., individuals hospitalized for suicidal thoughts), collaborations between researchers, and data sharing can advance cumulative evidence-building (Kirtley, Janssens, & Kaurin, 2022).

4.6. Clinical implications

Some preliminary implications for clinical practice can be formulated. First, the empirical evidence for the role of perceived burdensomeness in self-injurious thoughts at both the between- and within-person level suggests that clinicians and practitioners should be vigilant for about the role IPs play in their clients. However, more research is needed to detect risk within minutes or hours, which is necessary for the prevention and clinical management of SITBs. In addition, future research that identifies what may reduce feelings of perceived burdensomeness is essential. Second, findings suggest associations between a broad range of other IPs and SITBs and, therefore, incorporating an interpersonal view within treatment for SITBs could be useful, e.g., including family members in treatment among youth with SITBs (e.g., Glenn et al., 2019).

Finally, this review highlights the potential of ESM to provide clinical practice with a more reliable representation of how IPs play out in the daily lives of individuals with SITBs. For example, if visualisations of and individual information on clients' daily-life interpersonal experiences can be fed back into the therapy room, psychoeducation may be facilitated, and therapy can be adapted to the dynamic nature of these experiences (Weermeijer et al., 2023; Weermeijer et al., 2023). A promising future research avenue here is the development of real-time and just-in-time adaptive interventions (i.e., an intervention that is tailored to the individual's needs and provided at the time it is most needed) by further identifying dynamic, within-person fluctuations in interpersonal factors that increase risk for SITBs (Coppersmith, Fortgang, et al., 2022).

5. Conclusions

This review reflects a proliferation of investigated IPs in relation to SITBs that were assessed in highly heterogeneous ways. This hampers our ability to reliably interpret and synthesise findings across the literature. Studies found convergent evidence for the association between perceived burdensomeness and SITBs at the between- and within-person level. However, results from studies investigating other interpersonal processes were mixed. Future researchers are encouraged to prioritize research that develops and validates gold standard ESM items that assess interpersonal processes so that constructs can be operationalized in a consistent manner. Further, advanced temporal models that control for autoregressive parameters and use high sampling frequencies (i.e., over minutes/h) can help unravel the timescales of associations and further examine whether interpersonal processes are related to thoughts, behaviours, or the transition from thoughts to behaviours.

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CRediT authorship contribution statement

Julie J. Janssens: Conceptualization, Investigation, Writing – original draft. **Glenn Kiekens:** Conceptualization, Writing – review & editing, Supervision, Project administration, Funding acquisition. **Marieke Jaeken:** Investigation, Writing – original draft. **Olivia J. Kirtley:** Conceptualization, Writing – review & editing, Supervision, Project administration, Funding acquisition.

Declaration of competing interest

The authors have no competing interests to declare.

Data availability

No data was used for the research described in the article.

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.cpr.2024.102467.

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