

ORIGINAL ARTICLE

# Self-injury in young bisexual people: A microlongitudinal investigation (SIBL) of thwarted belongingness and self-esteem on non-suicidal self-injury

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## Abstract

**Background:** Bisexual people are at an elevated risk for non-suicidal self-injury (NSSI). Psychological factors including self-esteem and thwarted belongingness may help explain this risk. The aim of the current study was to investigate associations between self-esteem, thwarted belongingness and NSSI urges and behavior in young bisexual people.

**Methods:** Participants aged 16–25 from 25 countries took part in this microlongitudinal online survey study ( $N = 207$ ). Mixed-effects linear and logistic regression were used for analysis, given the nested structure of data. Analysis examined the relationship between self-esteem and thwarted belongingness on NSSI urges and behavior at the same point in time, and lagged by one week.

**Results:** At the same timepoint, self-esteem and thwarted belongingness both had significant between- and within-person associations with NSSI urges and behavior. For lagged models, self-esteem had significant between-person effects on urges, and thwarted belongingness had significant within-person effects. For NSSI behavior, both variables were only associated with between-person effects.

**Conclusion:** Findings support previous research suggesting the importance of self-esteem in explaining NSSI among sexual minorities. Preventative and intervention strategies to improve self-esteem may help reduce NSSI risk. Future studies should focus upon the experiences of bisexual people with intersecting identities and ensure that studies are statistically powered from inception to detect effects.

## KEYWORDS

bisexuality, lesbian, gay, bisexual, and transgender, non-suicidal self-injury, self-esteem, thwarted belongingness, urges, LGBT

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## INTRODUCTION

Non-suicidal self-injury (NSSI) is the act of deliberate self-inflicted damage to one's own body tissue, in the absence of suicidal intent and not for social or cultural reasons (International Society for the Study of Self-injury, 2018). NSSI is prevalent in adolescence and young adulthood (Hawton et al., 2003; Klonsky et al., 2014; Madge et al., 2008). A meta-analysis of 128 prevalence estimates from 119 records found pooled prevalence rates of NSSI for adults was 5.5%, compared to 13.4% in young adults and 17.2% among adolescents (Swannell et al., 2014). Sexual minority youth are at particular risk of suicide (Baiden et al., 2020) and NSSI (Smithee et al., 2019). Rates of NSSI among lesbian, gay, bisexual, and transgender (LGBT) people are much higher than heterosexual people (King et al., 2008) and being LGBT is a known risk factor for self-harm (Hawton et al., 2012). Hickson et al. (2017) found that younger gay and bisexual men were at significantly greater risk for self-injury compared to older men. A recent meta-analysis indicates that bisexual people have up to six times the odds of engaging in NSSI compared to heterosexual people, and up to four-and-a-half times the odds when compared to gay men (Dunlop et al., 2020). Mental health variables (depression and anxiety symptoms, and emotional regulation) alongside life experiences such as bullying and feelings of thwarted belonging were associated with NSSI (Dunlop et al., 2020). Results of the Dunlop et al. (2020) review demonstrate that NSSI among bisexual people warrants urgent empirical examination to investigate psychological mechanisms that might explain this relationship.

NSSI urges are a risk factor for NSSI behavior (Miller & Smith, 2008). Thoughts and urges to engage in NSSI are more common than behavior for adolescents (Stallard et al., 2013), are positively associated with distress and impairment (Washburn et al., 2010), and intense urges have been found to predict more frequent NSSI (Turner et al., 2019). Focusing on the processes that potentially contribute to the development of NSSI urges, as well as behavior, may help to better elucidate the psychological mechanism underlying this behavior.

Adolescence and young adulthood is a developmentally turbulent period (Casey et al., 2010). This is a time when rates of NSSI are high (Plener et al., 2015), and the concurrent development/exploration of sexuality is taking place (Moshman, 2014). NSSI has been linked to non-heterosexual orientation (Wilcox et al., 2012) during adolescence. Meyer's (2003) Minority Stress Theory proposed that being a sexual minority is stressful due to associated stigma and discrimination, and that minority stress confers risk for a range of mental health difficulties. This highlights the need for research into the possible

psychological mechanisms underlying this relationship. Hatzenbuehler (2009) extended this theory by proposing a "psychological mediation" framework. This framework posits that psychological processes mediate the relationship between minority stress and mental health difficulties. A recent ecological momentary assessment study found that greater experiences of minority stress predicted greater NSSI thoughts and behaviors at the same point in time, on the same day (Fehling, 2019).

Thwarted belongingness (the perception of impeded closeness to others, and the resulting unmet need to belong; Joiner, 2005; Van Orden et al., 2012) has been associated with NSSI risk for Lesbian, Gay, and Bisexual (LGB) students (Taylor et al., 2018), and for bisexual people as an independent group (Dunlop et al., 2020). Bisexual people can feel unwelcome and unsupported within the LGBT community (Dunlop et al., 2021; Ross et al., 2010). In the Bower et al. (2002) qualitative study, one participant described: "It's always viewed as sitting on a fence...You're neither fish nor fowl...you get shot at from both sides." Perception of "outsider" status may lead to increased feelings of isolation and thwarted belonging that could increase risk for NSSI.

Self-esteem has been defined as the evaluative or affective part of an individual's self-concept (Leary & Baumeister, 2000): how positively you feel about yourself. The relationships between being LGBT and having lower self-esteem are well documented, and research also supports an association between low self-esteem and the risk of engaging in NSSI (Forrester et al., 2017; Taylor et al., 2018). The recent Forrester et al. (2017) meta-analysis found a relationship between low self-esteem and NSSI in clinical and non-clinical samples with a consistently moderate-large pooled effect size that ranged from  $d = 0.59$ – $1.17$  (dependent on exclusion of outliers). Internalization of antibisexual narratives may distort the development of a positive bisexual identity (Israel & Mohr, 2004), thus contributing to lower self-esteem. Self-esteem could, therefore, partly explain the risk of NSSI found for bisexual people.

It is vitally important that psychological processes that underlie NSSI for bisexual people are investigated, given the clear difference in risk of NSSI for this group (Dunlop et al., 2020) and lack of bisexual-focused research (Taylor, 2018). Better understanding of the psychological processes that contribute to the experience of NSSI in young bisexual people may help us understand the heightened risk this population experience and develop more targeted interventions. A microlongitudinal research design, examining data over weeks rather than months/years, has the advantage of examining proximal and dynamic processes associated with NSSI urges. Indeed, the longitudinal investigation of NSSI and sexual minority status is a

recommendation of the Liu et al. (2019) meta-analysis. One strength of longitudinal methods is the ability to distinguish between within-person effects (i.e., relationships characterized by differences in variables over time for a given individual) and between-person effects (i.e., relationships characterized by differences between participants within the study; e.g., Curran & Bauer, 2011). This distinction can be helpful in considering the possible psychological processes that underlie these relationships. For example, between-person relationships may be indicative of a more static trait-like effect, while within-person effects may suggest more state-like processes at play. While previous studies have examined NSSI and bisexuality cross-sectionally (Dunlop et al., 2020), providing information about between-person effects, to date there has been no research investigating this longitudinally that we are aware of. It is therefore unclear if the relationship that self-esteem and thwarted belongingness have with NSSI in this population is best characterized as between-person effects, within-person effects, or both.

The current study aims to investigate both concurrent and prospective associations between NSSI and psychological factors (thwarted belongingness and self-esteem). Prospective effects focus on lagged associations between NSSI urges and psychological variables measured the preceding week. The study hypotheses were as follows:

1. Lower self-esteem scores will be associated with (i) more severe NSSI urges, and (ii) risk of NSSI, over the past week.
2. Lower self-esteem scores will be associated with (i) more severe NSSI urges, and (ii) risk of NSSI, over the following week.
3. A higher thwarted belongingness score will be associated with (i) more severe NSSI urges, and (ii) risk of NSSI, over the past week.
4. A higher thwarted belongingness score will be associated with (i) more severe NSSI urges, and (ii) risk of NSSI, over the following week.

These hypotheses were tested considering both within- and between-person effects.

## MATERIALS AND METHODS

### Design

A microlongitudinal design was used. Online assessments were completed at baseline (week one) followed by five weekly assessments (to week six). This study received ethical approval from University of Manchester Research Ethics Committee 3 Research Ethics Committee. The

protocol for this study was pre-registered on the Open Science Framework (registration: [osf.io/skrq8](https://osf.io/skrq8)) and this paper focuses on a subset of the planned hypotheses within this protocol. There were two departures from protocol: (1) rather than looking at the effect of predictors as a whole, we adapted the analysis to disaggregate between- and within-person effects, as these were deemed more informative; (2) we included NSSI behavior as an outcome alongside urges. In line with research guidance for working with bisexual people (BiUK, 2020), several bisexual people were consulted regarding the research design.

### Participants

To be eligible to take part, participants needed to (1) be aged 16–25 years, (2) identify as bisexual, or attracted to more than one gender, (3) have experienced NSSI thoughts, urges or behaviors within the preceding 6 months, (4) have access to a computer/smartphone with internet access and (5) be able to understand written English.

Multiple routes of recruitment were used to reach potentially eligible participants. These included advertisements placed around a University campus, Facebook groups, Twitter/Instagram/Reddit, alongside attendance at LGBT youth groups, and emails to LGBT support organizations to share details of the study with their groups. An active effort was made to recruit Black, Indigenous, and People of Colour (BIPOC) via BIPOC-specific groups and communication with UK Black Pride, in an attempt to gain a more diverse and representative sample.

The total number of participants was 207. Ages ranged from 16 to 26 (median = 20.50 years, interquartile range; IQR = 18–23), with one person consenting aged 25 but then turning 26 prior to completing the baseline survey. Participants resided in 25 different countries ( $N = 103$  from the United Kingdom). The majority of participants were cisgender women and identified as bisexual. Most (80%) were White British or White Other in ethnicity. Demographic details are provided in Table 1.

### Measures

#### Demographics questionnaire

A bespoke questionnaire at baseline recorded participant age, gender, sexuality, ethnicity, employment status, and marital status. Defining bisexuality can be complex (Rust, 2000). Some individuals may describe themselves as pansexual, and others, bisexual. Others may have same-sex and other-sex attractions to lesser or greater degrees. For this reason, multiple options were given to allow participants

TABLE 1 Sample characteristics

Variable	N (%)
Gender	
Female	135 (66.18)
Male	25 (12.25)
Non-binary	28 (13.73)
Transgender	16 (7.84)
Sexuality	
Bisexual	123 (60.29)
Pansexual	52 (25.49)
Mostly homosexual	8 (3.92)
Mostly heterosexual	5 (2.45)
Other <sup>a</sup>	16 (7.84)
Ethnicity	
White British	94 (46.08)
White other	69 (33.82)
Asian or Asian mixed	14 (6.86)
Black or Black mixed	9 (4.41)
Arab	2 (0.98)
Other	16 (7.84)
Country of residence	
United Kingdom	103 (50.49)
North America	56 (27.45)
Europe	26 (12.75)
Central/South America	6 (2.94)
Australasia	5 (2.45)
Africa	4 (1.96)
South Asia	4 (1.96)
Employment	
Student	131 (64.22)
Full-time employed	34 (16.67)
Part-time employed	18 (8.82)
Unemployed	18 (8.82)
Volunteer	3 (1.47)
Marital status	
Single	125 (61.27)
Partnered	70 (34.31)
Polyamorous	5 (2.45)
Married	2 (0.98)
Open relationship	2 (0.98)
Engaged in NSSI	189 (92.65)
NSSI method <sup>b</sup>	
Cut or carved skin	152 (74.51)
Hit self on purpose	104 (50.98)
Picked skin until bled	81 (39.72)
Scraped skin until bled	78 (38.24)

TABLE 1 (Continued)

Variable	N (%)
Burned skin	74 (36.27)
Inserted objects into skin	32 (15.69)
Self-tattooed	18 (8.82)
Other <sup>c</sup>	53 (25.98)

<sup>a</sup>Other responses: Bisexual (attracted to two or more genders) ( $N = 7$ ); queer ( $N = 3$ ); biromantic, asexual ( $N = 2$ ); bisexual but mostly attracted to women ( $N = 1$ ); bicurious ( $N = 1$ ); polysexual ( $N = 1$ ).

<sup>b</sup>Participants could select more than one method.

<sup>c</sup>Other NSSI methods included biting self, scratching, excess exercise, drinking toxic substances, self-strangulation, pushing fingers into bruises.

to self-identify along a “bisexual spectrum,” from “mostly heterosexual or mostly homosexual” to bi/pansexual.

### Self-injurious Thoughts and Behaviors Interview—Short Form (SITBI-SF; Nock et al., 2007)

The NSSI component of the SITBI-SF was used to assess the occurrence, nature, and frequency of NSSI behavior at baseline. A definition of NSSI was provided on this measure. One question from this scale (“How many times in the past week have you engaged in NSSI?”) was also administered in weekly follow-ups. The SITBI-SF demonstrates strong test-retest reliability and concurrent validity with other measures of NSSI (Nock et al., 2007).

### Alexian Brothers Urge to Self-Injure Scale (ABUSI; Washburn et al., 2010)

The ABUSI is a five-item measure that examines urges to self-injure over the previous week. The ABUSI derives a total score ranging from 0 to 30, with higher scores indicating more intense urges to self-injure and demonstrates good validity and reliability (Washburn et al., 2010). The ABUSI was administered at baseline and at weekly follow-ups. Cronbach's alpha for this measure at baseline in the current study was 0.92.

### Suicide Resilience Inventory-25 (SRI-25): Internal Protective subscale (SRI-25; Osman et al., 2004)

The nine-item Internal Protective subscale of the SRI-25 was used to measure self-esteem, including items such as “I like myself.” Items from this subscale were successfully used to measure self-esteem in an earlier study on self-harm

and sexual orientation, with the factor structure and reliability of items supported in previous studies ( $\alpha = 0.94$ ; Taylor et al., 2018). This subscale was administered at baseline and at weekly follow-ups (range = 9–54, with higher scores indicating higher self-esteem). Cronbach's alpha at baseline was 0.88 in the current sample.

### Interpersonal Needs Questionnaire (INQ): Thwarted Belonging subscale (Van Orden et al., 2012)

The eight-item thwarted belonging subscale of the INQ was used to measure thwarted belongingness. The INQ includes items such as “These days, I feel like I belong.” This subscale has strong convergent validity with measures of loneliness and social worth; related constructs of thwarted belonging (Van Orden et al., 2012). This subscale has good internal reliability (Cronbach's alpha ranged from 0.81 to 0.90 across various samples; Hill et al., 2015). Total scores could range from 7 to 56. Greater scores indicate greater thwarted belonging. This subscale was administered at baseline and at weekly follow-ups and had a Cronbach's alpha of 0.86 at baseline.

## Procedure

Individuals who were interested in learning more about the study completed an online consent-to-contact form. A researcher made contact via telephone or email to provide further information on the study, direct the individual to the participant information sheet and answer any questions. If participants wished to proceed they were emailed a link to a consent form, which included the participant information sheet again. Once they had completed the consent form and submitted this online, participants were emailed a link to the baseline measures, along with bespoke login details to access each survey. They were then prompted by text message or email to complete weekly follow-up surveys. The study period was six weeks. To be eligible, follow-up data points had to be completed within three days of the intended follow-up date. Data points provided outside of this window were excluded from analyses. A list of relevant helplines and websites was provided at the end of each survey, should participants have required them.

## Analysis

Mixed-effects linear regression was used to estimate relationships with NSSI urges, given that data were nested at two levels: timepoint (level 1) within participant (level 2).

Separate models were estimated testing concurrent associations (association between variables at the same time point) and lagged associations (lagging predictor variables by one week). Past week NSSI behavior frequency was heavily skewed, with a large proportion of zeros, and so this variable was dichotomized for analyses (0 = no NSSI over past week; 1 = NSSI over the past week). Mixed-effects logistic regression was used to analyze association with this outcome. Mixed-effects models can accommodate cases with incomplete data, assuming data are “Missing At Random” (Schafer & Graham, 2002).

Analyses used random-intercept models. Given the limited number of assessment points per person, exacerbated by the presence of missing data, random slopes could not be estimated without convergence issues. For the linear models, Restricted Maximum-Likelihood Estimation (Snijders & Bosker, 2011) was used, and inferential testing of fixed-effects used *t* tests and Satterthwaite's approximation for the degrees of freedom (Luke, 2017). Level 1 and 2 residuals were checked for all models and were normally distributed. Maximum-likelihood estimation was used for the logistic models.

Predictor variables (self-esteem, belongingness) were group-mean centered and included in the models along with the person mean for that variable. This allows the within- and between-person effect of the variable to be disaggregated. This method is valid when predictors have no linear time trends, which was the case here (Curran & Bauer, 2011). All analyses were conducted using *R* (R Core Team, 2019).

Power to detect standardized level 1 associations was estimated using Monte Carlo simulation. This required a priori estimates of both model and predictor variances, which were unknown. As such, data were generated under varying conditions: (1) equal variance split in predictor and model variances; (2) 0.75/0.25 model variance (level 2/level 1) holding predictor variance equal; (3) 0.25/0.75 model variance; (4) 0.75/0.25 predictor variance split (level 2/level 1) holding model variances equal; and (5) 0.25/0.75 predictor variance split. A sample size of  $N = 100$  resulted in over 99% power to detect a standardized effect of 0.3 under all conditions. For a small effect ( $B = 0.1$ ), the variance split is important: under the most favorable conditions (2)  $N = 100$  results in 85% power, however, in the least (4)  $N = 200$  would be required for 73% power. Based on the simulated power analysis, the SIBL project aimed to recruit  $N = 200$ . Accounting for up to 50% attrition, this would maintain empirical power at  $N = 100$ .

## RESULTS

Almost all participants ( $N = 189$ , 93%) had a history of NSSI behavior. More than half of participants

( $N = 137$ , 67%) reported NSSI in the past month. The median frequency of past year NSSI was 10 (IQR = 4–30, range = 0–730). The median frequency of NSSI in the past month was 1 (IQR = 0–3, range = 0–143). The most commonly reported methods of NSSI were cutting or carving the skin and hitting the self on purpose. Descriptive statistics for study variables across the time points are reported in Table S1. Total completion of each weekly measure ranged from 97% to 47%. The survey prompted participants if they had missed an item and consequently where participants had started a survey, there were no missing data within any measures. Missing data therefore only occurred where participants missed a survey altogether.

Both self-esteem and thwarted belongingness were stable across the six weeks (see Table S1), with variance largely at the between-person level (intraclass correlation coefficient: belongingness = 0.73; self-esteem = 0.82). It was therefore important to determine whether associations with NSSI urges and behavior reflected between-person effects (i.e., differences between participants in their average levels of self-esteem or belongingness over the study period), or within-person effects (i.e., differences from one week to the next in a person's levels of self-esteem or belongingness).

### Concurrent associations with NSSI urges

The concurrent relationships between self-esteem, thwarted belongingness, and NSSI urges were graphed to explore associations (Figure 1). Self-esteem scores were negatively associated with urge severity and thwarted belongingness positively associated with urges severity.

Mixed-effects linear regression was used to investigate the concurrent associations between self-esteem, thwarted belongingness, and NSSI urges. Bivariate and adjusted associations were estimated. Adjusted associations included both predictors (self-esteem and belongingness) as well as NSSI history (no history = 0, history = 1), relationship status (single = 0 vs. in a relationship = 1), gender identity (cisgender = 0 vs. trans/non-binary = 1), location (UK or US = 0, elsewhere = 1), and age in the models as covariates. Results of these analyses are presented in Table 2.

For the unadjusted analyses, self-esteem and thwarted belongingness both had significant between- and within-person association with NSSI urges, indicating that both a person's average level of these variables and week-to-week fluctuations, were associated with the severity of urges within the same week. Greater thwarted belongingness and lower self-esteem were related to greater urge severity. For the adjusted analyses, results were the same, except

that the between-person effect of thwarted belongingness was no longer significant.

### Lagged associations with NSSI urges

The above analyses were repeated, but with the predictors lagged by a week, so that the association that past-week self-esteem and thwarted belongingness had with urge severity over the following week was estimated. Results are displayed in Table 2. Self-esteem only had a significant between-person effect on urges. In contrast, thwarted belongingness only had a significant within-person effect (there was an unadjusted between-person effect that was no longer statistically significant in the adjusted model).

### Concurrent associations with NSSI behavior

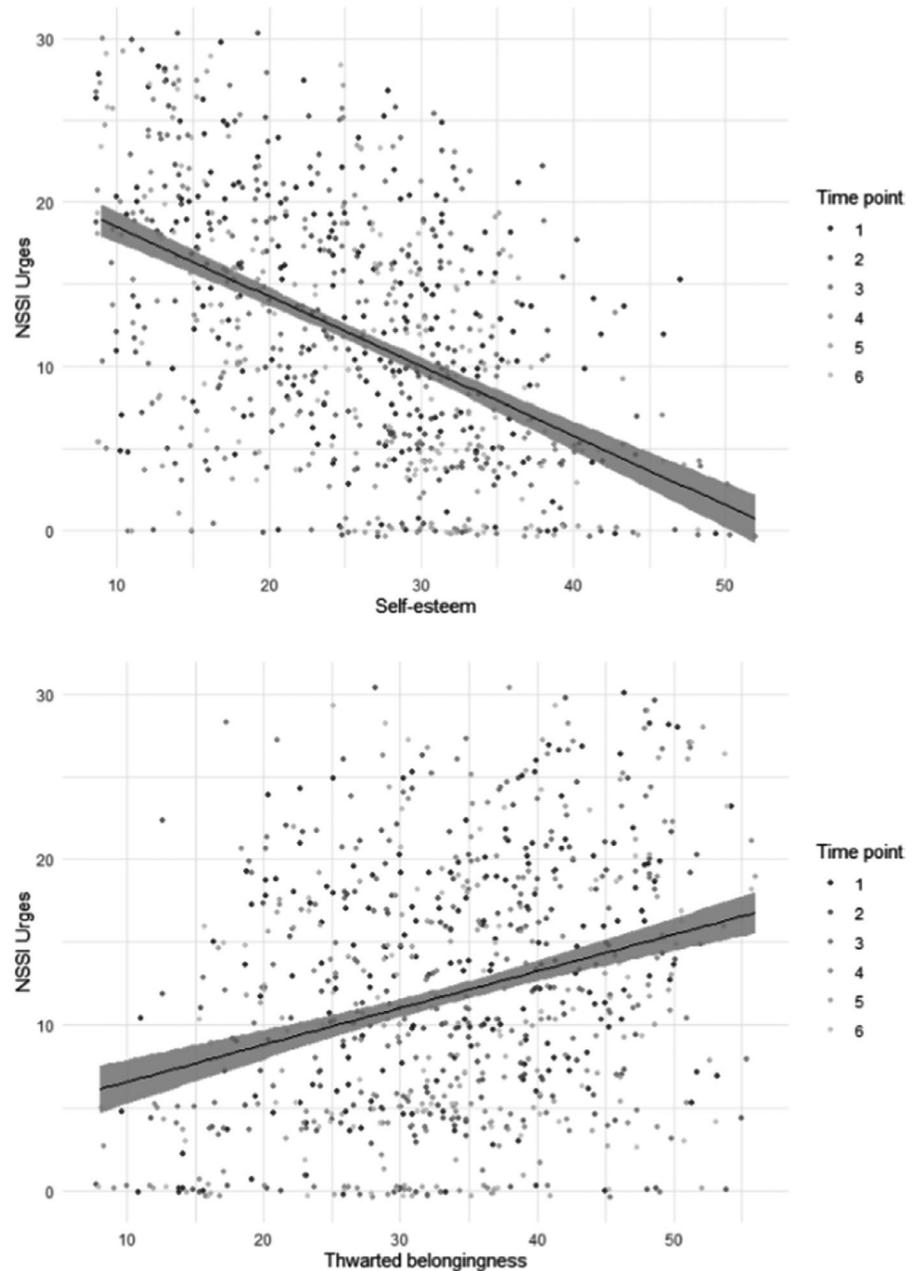
Analyses were repeated with NSSI behavior (binary) as the outcome. Again we estimated unadjusted associations between predictors and NSSI, and also associations adjusting for other variables. Logistic models with binary predictors at relatively low frequencies for some groups can run into convergence issues, due to problems such as partial separation of the data. We found this was the case within the adjusted analyses where a number of categorical covariates were included (e.g., gender, location, and ethnicity). Therefore, for adjusted analyses, we just included continuous variables (self-esteem, thwarted belongingness, and age). Results of these analyses are in Table 3.

For the unadjusted analyses, self-esteem and thwarted belongingness both had significant between- and within-person association with NSSI, indicating that both a person's average level of these variables and week-to-week fluctuations, were associated with the occurrence of NSSI within the same week. Greater thwarted belongingness and lower self-esteem were related to greater odds of NSSI. For the adjusted analyses, results were the same, except that, as with urges, the between-person effect of thwarted belongingness was no longer significant.

### Lagged associations with NSSI behavior

When predictors were lagged by a week, only between-person associations with NSSI were significant, but these effects were no longer significant within the adjusted model (see Table 3).

**FIGURE 1** Concurrent associations between predictors (self-esteem and thwarted belongingness) with NSSI urges



## DISCUSSION

This study aimed to investigate associations between the psychological variables of self-esteem and thwarted belongingness, and NSSI, for a young bisexual sample. In order to better understand these relationships, we disaggregated the effects of predictors into between- and within-person relationships. For self-esteem, when focusing on relationships within the same week, there were significant between- and within-person associations with NSSI urges and behavior. Higher average levels of self-esteem, and experiencing a weekly elevation in self-esteem, were both linked to lower NSSI urges severity and lower risk of NSSI behavior. However, within lagged analyses, there was only a between-person effect of self-esteem on NSSI urges and behavior (and

this was no longer significant in the adjusted analyses where NSSI behavior was the outcome). Therefore, there was no evidence that a weekly elevation in self-esteem was related to the odds of NSSI the following week. For thwarted belongingness, while both within- and between-person concurrent effects were associated with NSSI urges and behavior, within the adjusted models it was only the within-person association that remained significant. This suggests that week-by-week fluctuations in thwarted belongingness, rather than average levels, may be linked to NSSI. Within lagged analyses, the same pattern emerged where the outcome was NSSI urges. However, for NSSI behavior, there was only a lagged between-person effect of thwarted belongingness that was no longer apparent in the adjusted model. Both self-esteem and thwarted belongingness were relatively stable over the

Predictor	Bivariate		Adjusted <sup>a</sup>	
	B (95% CI)	p	B (95% CI)	p
Concurrent associations				
Self-esteem (within)	-0.33 (-0.42, -0.23)	<0.001	-0.26 (-0.36, -0.15)	<0.001
Self-esteem (between)	-0.40 (-0.50, -0.31)	<0.001	-0.37 (-0.48, -0.26)	<0.001
Thwarted belongingness (within)	0.20 (0.13, 0.27)	<0.001	0.12 (0.04, 0.19)	0.002
Thwarted belongingness (between)	0.22 (0.12, 0.31)	<0.001	0.05 (-0.06, 0.15)	0.396
Lagged associations				
Self-esteem (within)	-0.04 (-0.16, 0.08)	0.496	0.03 (-0.11, 0.16)	0.723
Self-esteem (between)	-0.37 (-0.48, -0.26)	<0.001	-0.35 (-0.47, -0.22)	<0.001
Thwarted belongingness (within)	0.10 (0.02, 0.19)	0.023	0.12 (0.02, 0.22)	0.022
Thwarted belongingness (between)	0.18 (0.07, 0.29)	0.002	0.01 (-0.11, 0.14)	0.837

Note: All models are random-intercept models.

<sup>a</sup>Adjusted analyses control for age, gender (cisgender vs. non-cisgender), ethnicity (white vs. non-white), NSSI history (NSSI vs. no NSSI), relationship status (single vs. not single), location (UK or US vs. elsewhere).

TABLE 2 Results of mixed-effect linear regression analyses with NSSI urges as outcome

Predictor	Bivariate		Adjusted <sup>a</sup>	
	OR (95% CI)	p	OR (95% CI)	p
Concurrent associations				
Self-esteem (within)	0.90 (0.85, 0.95)	<0.001	0.93 (0.88, 0.99)	0.033
Self-esteem (between)	0.92 (0.88, 0.96)	<0.001	0.92 (0.88, 0.97)	<0.001
Thwarted belongingness (within)	1.09 (1.04, 1.14)	<0.001	1.07 (1.02, 1.12)	0.006
Thwarted belongingness (between)	1.05 (1.01, 1.09)	0.008	1.01 (0.97, 1.05)	0.657
Lagged associations				
Self-esteem (within)	0.98 (0.92, 1.05)	0.572	1.00 (0.93, 1.08)	0.929
Self-esteem (between)	0.94 (0.90, 0.99)	0.008	0.97 (0.92, 1.02)	0.209
Thwarted belongingness (within)	1.04 (0.99, 1.10)	0.133	1.04 (0.98, 1.10)	0.181
Thwarted belongingness (between)	1.07 (1.02, 1.11)	0.003	1.04 (0.99, 1.09)	0.098

Note: All models are random-intercept models.

Abbreviation: OR, odds ratio.

<sup>a</sup>Adjusted analyses control for age.

TABLE 3 Results of logistic mixed-effect regression analyses with NSSI as outcome

study period, with variance largely attributable to between-person differences, and this mirrors past research (e.g., Bodel et al., 2020; Donnellan et al., 2007).

In contrast to self-esteem, thwarted belongingness demonstrated more of a within-person association with NSSI. Despite the stability of this variable over time, experiencing a week with higher than usual levels of thwarted belongingness was related to more severe NSSI urges the following week (though this effect did not hold for NSSI behavior). It might therefore be speculated that thwarted belongingness has a more dynamic association with NSSI urges, than self-esteem, though further confirmation of these findings is needed. Thwarted belongingness as a concept is related to the unmet need to belong to a group (Van Orden et al., 2012). Resultant feelings of disconnect, loneliness, or rejection from others conceptually link to NSSI, given that NSSI is often used to manage intense emotions (Taylor et al., 2018). Results from the current study are consistent with past research demonstrating a positive association between thwarted belongingness and NSSI urges and behavior (Assavedo & Anestis, 2016; Chu et al., 2016; Muehlenkamp et al., 2015). If week-by-week changes in belongingness do lead to changes in NSSI risk, then this construct may represent an important target for psychological interventions for young bisexual people at risk of NSSI.

The results support earlier work demonstrating an association between low self-esteem and difficulties with NSSI, both within LGBT individuals (Taylor et al., 2018) and the wider population (Forrester et al., 2017). This study builds on the previous cross-sectional studies by differentiating between concurrent and lagged associations, and between- and within-person effects. The lack of any lagged within-person effects of self-esteem with NSSI urges or behavior appear inconsistent with the idea that changes in self-esteem have an effect on a person's subsequent NSSI risk. However, it may be that such a relationship occurs over a shorter period of time, and that the impact that a decline in self-esteem has on NSSI urges or behavior diminishes by the following week. It should also be noted that self-esteem was very stable across the six weeks, reducing the likelihood of identifying within-person effects. It may therefore also be the case that low self-esteem represents a relatively fixed, trait-like risk factor for NSSI, though further research into these possibilities is needed. Self-esteem is lower among sexual minority individuals compared to heterosexual individuals (Bridge et al., 2019), and therefore self-esteem may partly explain the heightened risk of NSSI seen in these populations. Hooley & Franklin (2018) describe a positive view of the self as being a "barrier" to engaging in NSSI in their Benefits and Barriers model, and self-esteem ("representations of self") is also an important variable in the Hasking et al. (2017) cognitive-emotional model of NSSI.

The microlongitudinal design allowed for associations between variables over time to be examined, rather than drawing conclusions based on cross-sectional results. However, lagged associations still do not allow causal inferences to be made. Interventionist-causal approaches (Kendler & Campbell, 2009) would help to establish a causal relationship between study variables. For example, the impact of interventions designed to target low self-esteem or feelings of thwarted belongingness on subsequent NSSI urges and behavior could be evaluated. Almost 80% of the sample were White British or White Other, despite recruitment efforts to specifically target BIPOC via BIPOC-specific groups. This means that relevance of current findings may not extrapolate to BIPOC. Finally, the aim of this study was to examine factors associated with NSSI urges in bisexual people, due to evident risk demonstrated within this group (Dunlop et al., 2020). While the results of this study provide an insight around psychological processes that may contribute to NSSI risk in young bisexual people, the study does not tell us whether these processes are the same or different when compared to non-bisexual individuals. Future research could build on these findings by investigating whether factors like self-esteem and belongingness have a differential effect on NSSI across different sexual minorities and majorities.

The potential relationships between lower self-esteem, greater feelings of thwarted belongingness and NSSI urges and behavior provide some directions for bisexual-specific intervention, at multiple prevention and intervention levels (Sloan & Shipherd, 2019). Psychological intervention such as Cognitive Behavioral Therapy for self-esteem has been found to be effective for sexual minority people (Chaudoir et al., 2017; Lucassen et al., 2015; Ross et al., 2008). Evidence of efficacy of these interventions is, however, limited and more research is needed to evaluate this. LGBT or bisexual-specific youth groups can help young people improve their self-esteem and feel like they are connected to others by facilitating safe, supportive and compassionate spaces to explore identity (Romijnders et al., 2017). For any young person seeing a therapist, therapists should be attuned to self-esteem or thwarted belongingness as potential risk factors for NSSI, if they are aware of their client's bisexuality.

From a preventative structural and systemic perspective, bisexual-positive and affirmative messages could be embedded within educational establishments from an early age (Feinstein et al., 2019). Invisibility and isolation have been found to be associated with NSSI for LGBT youth (Nickels, 2013) and may relate to low self-esteem and greater feelings of thwarted belonging experienced by this group. Increased teaching of sexuality and gender diversity within lessons is also needed, including the challenging of common bisexual stereotypes and prejudicial

assumptions, given that discrimination for gay and bisexual men is predictive of lower self-esteem (Huebner et al., 2004). Crucially, bisexual people from an early age need to be afforded the opportunity to internalize positive narratives and appraisals of their identity, given that prejudice exists even from other sexual minority individuals, and staying “closeted” can impact on self-esteem (McCann et al., 2020; McLean, 2008).

## CONCLUSION

Findings support previous research suggesting the importance of self-esteem in explaining NSSI among sexual minorities. Lower self-esteem and greater feelings of thwarted belongingness may account for risk of NSSI in bisexual people. The current study has demonstrated that recruitment of bisexual people is feasible using a targeted approach focused on youth groups, online social media, university LGBT societies, and national charities. Independent analysis of bisexual people is essential given that general minority stress experiences paired with bisexual-specific stressors are likely to need targeted support. The results support the possibility that self-esteem and thwarted belongingness play a role in the occurrence of NSSI in young bisexual people, but these relationships may have different temporal characteristics.

## AUTHOR CONTRIBUTIONS

**Brendan James Dunlop:** Conceptualization (lead); Data curation (lead); Formal analysis (equal); Investigation (equal); Methodology (equal); Project administration (lead); Resources (lead); Validation (equal); Writing – original draft (lead); Writing – review & editing (lead). **Sophie Elizabeth Coleman:** Conceptualization (equal); Data curation (equal); Formal analysis (equal); Investigation (equal); Methodology (equal); Project administration (equal); Writing – review & editing (equal). **Samantha Hartley:** Conceptualization (supporting); Investigation (supporting); Methodology (supporting); Project administration (supporting); Supervision (supporting); Writing – review & editing (equal). **Lesley-Anne Carter:** Data curation (equal); Formal analysis (equal); Methodology (equal); Writing – review & editing (supporting). **Peter Taylor:** Conceptualization (equal); Formal analysis (equal); Investigation (equal); Methodology (equal); Project administration (equal); Supervision (lead); Writing – review & editing (equal).

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## SUPPORTING INFORMATION

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