**Developmental associations between bullying victimization and suicidal ideation and
direct self-injurious behavior in adolescence and early adulthood**

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Abstract

Background: Bullying, suicide, and self-injury are significant public health issues among young people. Extensive research has documented bullying victimization associations with suicidal ideation and self-injury; however, the modeling approaches used have mostly not addressed the relations between these constructs at the within-person level and it is these links that are critical for testing developmental theories and guiding intervention efforts. This study thus aimed to examine the within-person, bidirectional relations between these constructs in adolescence and early adulthood. **Methods:** Participants were from the Zurich Project on Social Development from Childhood to Adulthood (z-proso). Random intercept cross-lagged panel models (RI-CLPMs) were employed to evaluate the within-person associations between general and sexual bullying victimization and suicidal ideation and direct self-injurious behavior (D-SIB). **Results:** There was a positive within-person effect of age 15 general bullying victimization on age 17 suicidal ideation ($\beta=.10$) and age 17 suicidal ideation on age 20 general bullying victimization ($\beta=.14$), suggesting that these constructs may be reciprocally related. **Conclusions:** Results imply that general bullying victimization and suicidal ideation can have detrimental effects on each other over developmental time but at different stages. Future studies employing briefer intervals will be needed to investigate short-term dynamics between bullying victimization and suicidality/self-injury.

Keywords: Suicidal ideation; direct self-injurious behavior; general and sexual bullying victimization; adolescence and early adulthood

Abbreviations: Direct self-injurious behavior (D-SIB)

Suicide is a leading cause of mortality among adolescents and young adults worldwide (World Health Organization, 2019). Two well-established predictors of suicide attempt and completion are suicidal ideation and self-injury (see Castellví et al., 2017; Olfson et al., 2018; for reviews). Suicidal ideation is defined as “thinking about, considering, or planning suicide” (Klonsky et al., 2016), and is prevalent in adolescence (lifetime prevalence of 19.8%-24.0%; Nock et al., 2008) and early adulthood (lifetime prevalence of 22.3%; Mortier et al., 2018). Following Brunner et al. (2014), direct self-injurious behavior (D-SIB), refers to intentional self-inflicted damage to an individual body’s surface (e.g., cutting, burning, hitting), irrespective of suicidal intent. D-SIB is common among young people, with 27% reporting D-SIB at least once between ages 13-20 in one recent study (Steinhoff, Ribeaud et al., 2020).

Bullying victimization has been proposed as a risk factor for youth suicidal ideation and D-SIB (see, e.g., Heerde & Hemphill, 2018; Holt et al., 2015, for reviews). It refers to exposure to aggressive behavior characterized by intention to harm, repetition, and a power imbalance and may take place in person or online, where the latter is referred to as ‘cyberbullying’ (Gladden et al., 2014; Olweus, 1993). Bullying victimization has been estimated to affect 35% of young people (Modecki et al., 2014) and has been shown to potentially affect a wide range of outcomes such as substance use, depression, and suicidality (e.g., Moore et al., 2017, for a review). Bullying victimization can take a number of forms, including behaviors that are verbal, relational (e.g., excluding someone), physical, or involving property damage (Gladden et al., 2014). However, sexual bullying victimization (also sometimes referred to as sexual harassment), as a particular form of bullying deserves special attention. It has been shown in factor analyses to be less closely related to other forms

of bullying, leading to the proposal that it should be treated as a distinct construct from general bullying victimization (Murray et al., 2019); however, it also has been shown to have a detrimental effect on mental health (Dworkin et al., 2017).

The effect of bullying victimization on suicide risk in young people, particularly adolescents, has received considerable attention (see, e.g., Heerde & Hemphill, 2018; van Geel, et al., 2021, for reviews). The relations between bullying victimization and suicidality/self-injury may not, however, be only unidirectional. From the stress generation model perspective, for example, it has been proposed that certain diatheses for suicidality and self-injury such as emotional dysregulation (Law et al., 2015) and social problem solving (Speckens & Hawton, 2005) may lead to subsequent interpersonal stressors (Liu & Spirito, 2015; Burke et al., 2015). This suggests that longitudinal empirical research that considers bidirectional pathways is crucial to determine the direction of associations between bullying victimization and suicidal ideation/D-SIB at different stages of development. Knowledge of this is essential to guide prevention and intervention efforts. For example, if bullying victimization cannot predict subsequent increases in suicidal ideation/D-SIB, then suicide intervention efforts on proximal factors are likely to produce better effects. If they are reciprocally related to each other, efforts from either side might effectively break the vicious cycle. However, most longitudinal studies have examined the effect of victimization on suicidality/self-injury only (i.e., solely in a single directional pathway, e.g., Perret et al., 2020). A small number of longitudinal studies, using cross-lagged panel models (CLPMs), have examined bidirectional relations between them, yielding mixed findings. For example, a study of 238 Canadian adolescents examined the bidirectional relations between peer

victimization, suicidal ideation, and alcohol use within a CLPM model (Marschall-Lévesque et al., 2017). Victimization at age 13 was associated with suicidal ideation at age 14, but not from age 14 to 15, and there were only non-significant reverse pathways (i.e., from suicidal ideation to victimization). Brunstein Klomek et al. (2019) employed longitudinal assessments with two different intervals (i.e., 3- and 12-months), in an adolescent sample ($n=2,933$; age range 13-18) from 10 European countries. Their results suggested that physical and relational victimization were related to suicidal ideation or attempts; however, only suicidal attempts were linked to physical victimization in the reverse direction. In terms of early adulthood, a four-year, four-wave longitudinal study based on 1,483 American students (aged 21-29) indicated reciprocal associations between cyber-victimization and suicidal ideation over time (Wright, 2016).

In terms of the associations between bullying victimization and D-SIB, Marshall et al. (2013) used separate Swedish ($n=513$, age range 12-15) and Canadian ($n=161$, $M_{age}=13.82$ years) longitudinal datasets to find a bidirectional association between sexual harassment and self-injury in the Swedish sample, while the Canadian sample supported only self-injury associations with subsequent sexual harassment. Another study found non-significant cross-lagged relations between bullying victimization and non-suicidal self-injury over a period of about five months in a New Zealand sample ($n=1162$, $M_{age}=16.35$; Garisch & Wilson, 2015).

The above-reviewed research has contributed to a growing understanding of longitudinal associations between bullying victimization and suicidal ideation/self-injury in young people and provides preliminary support for the idea that their relations may be reciprocal.

Nevertheless, there are important methodological limitations in previous studies. Specifically, previous studies examining victimization-suicidal ideation/self-injury associations have typically used CLPMs or other traditional regression techniques, which provide parameters that reflect a mixture of between- and within-person effects. The between-person association approximates relatively stable differences between persons (Hamaker et al., 2015). For instance, Adolescent A may report high levels of exposure to victimization and show suicidal ideation, whereas adolescent B may report no recent victimization or suicidal ideation (the differences between adolescents A and B can be modeled and reflected by between-person analyses). But this does not imply that adolescent A's (or B's) own experience of an increase or decrease in victimization would lead to a change in their suicidal ideation from their typical level (and vice versa). The latter describes the process occurring within individuals that can be captured by the within-person model.

The within-person association between variables is based on fluctuations within a person over time (i.e., more akin to the causal processes referred to in developmental theories; Hamaker et al., 2015). As such, examining within-person processes is recognized as a developmentally relevant approach and a more sensitive technique for determining the temporality of longitudinal associations. Indeed, it can be problematic if findings at the between-person level are to be used as a basis for future prevention or intervention programs designed to causally induce within-individual change over time if they are at odds with the within-person effects (Hamaker et al., 2015). Direct estimates of within-person associations, in contrast, provide a more appropriate guide for the development of effective interventions targeting mechanisms of changes. Accordingly, understanding this type of association is of

substantial interest for developmental theories, intervention science, and clinical practice (Curran & Bauer, 2011).

Previous empirical research has shown that in the developmental psychopathology field, within-person relations do often differ from the between-person relations and from the blended parameters of the CLPM, sometimes even showing effects in the opposite direction. For example, research in the current sample illustrated different within-person versus CLPM relations between externalizing and internalizing problems (Murray et al., 2020), while others have illustrated this in relation to the links between parenting and conduct problems (Besemer et al., 2016), and between corporal punishment and aggression (Berry & Willoughby, 2017). As such, the possibility that relying on non-disaggregated effects can mis-lead is not merely a theoretical possibility.

Gender differences in the associations between bullying victimization and suicidal ideation/D-SIB should also be considered. In particular, it has been proposed that females are more sensitive to interpersonal stress and are more likely to be sexually harassed than their male counterparts (e.g., Natsuaki et al., 2009; Steinhoff, Bechtiger et al., 2020). However, findings on gender differences are mixed, with some studies finding a stronger association for female youth (e.g., Heerde & Hemphill, 2018) and some finding no gender differences (e.g., Holt et al., 2015). Further research is needed, especially longitudinal studies, to help illuminate the gender dynamic in these relations.

The Current Study

Given the significance of focusing on within-person processes for advancing theory, prevention and interventions for suicidality and self-injury, the current study examines the

longitudinal, bidirectional, within-person associations between general and sexual bullying victimization and suicidal ideation and D-SIB in adolescence and emerging adulthood. We hypothesized that: (1) general and sexual victimization would predict later within-person increases in suicidal ideation and D-SIB (2) suicidal ideation and D-SIB would predict subsequent within-person increases in general and sexual victimization.

Method

Participants and procedure

Participants were from the z-proso study, an ongoing longitudinal study of children from 56 primary schools, randomly selected from 90 public schools in Zurich (i.e., the largest city of Switzerland). The data collection started when children were 7 years old. We used data from the four most recent waves: Five (age 13), six (age 15), seven (age 17), and eight (age 20), because the measures of interest were included in these waves. However, the suicidal ideation was first measured when participants aged 15. A total of 1482 (for the analysis of self-injury) and 1465 (for the analysis of suicidal ideation) adolescents (52% male) participated at least once between ages 13 and 20 and between ages 15 and 20, respectively, from a total target sample of 1675. Non-response/attrition was higher for some immigrant background groups (i.e., non-native speaking parents); however, the sample has otherwise been found to show little non-random attrition. Comprehensive reporting of non-response and attrition information of the z-proso can be found in the study of Eisner et al. (2019). Missing data were handled with full information maximum likelihood estimation, which provides optimal parameter estimates when data are missing at random. Full details regarding z-proso, including the recruitment, assessments, and demographic characteristics, were reported

elsewhere (e.g., Eisner et al., 2019), and further information can be found via the study website (<http://www.jacobscenter.uzh.ch/en/research/zproso/aboutus.html>). Z-proso data have been used previously to examine the links between stressful life events and self-injury. Steinhoff, Bechtiger et al (2020) for example, found strong short-term effects of peer victimization on self-injury. The current study builds on these analyses by disaggregating between- and within-person effects to provide a measure of the latter unconfounded by time-stable between person differences.

Ethical considerations

This study was approved by the Ethics Committee from the Faculty of Arts and Social Sciences of the University of Zurich. Direct informed consent was obtained from the participants at age 13 onwards.

Measures

Suicidal ideation and D-SIB

Suicidal ideation was measured using an item in which youth reported how often they had thought about suicide during the past month, using a five-point scale (1=*never* to 5 =*very often*). D-SIB was assessed with one item that asked how often adolescents had intentionally self-injured during the past month. Examples of D-SIB were provided and referred to cutting an arm, tearing wounds open, hitting one's head, and tearing out one's hair. Participants reported their D-SIB frequency on a five-point scale (1=*never* to 5=*very often*). Such one-item measures are commonly used to assess young people's suicidal ideation (e.g., Marschall-Lévesque et al., 2017; Perret et al., 2020) and D-SIB (e.g., Donath et al., 2019), which can serve as a brief and valid approach for screening for suicidal thinking or self-injury.

Previous research used these two items in the current sample and found support for the validity of these assessments (Steinhoff, Ribeaud et al., 2020).

General and sexual bullying victimization

General and sexual bullying victimization were both measured by the Zurich Brief Bullying Scales (ZBBS; Murray et al., 2019), which was an adaptation of often-used bullying scales developed by Olweus (1996). The ZBBS includes five items, four of which are used to assess general bullying victimization (physical, verbal, social, and property damage) and one to evaluate sexual bullying victimization (e.g., hit on you, groped you). Adolescents reported the frequency of these experiences within the last year on a six-point scale: 1=*never*, 2=*1 to 2-times*, 3=*3 to 10-times*, 4=*about once a month*, 5=*about once a week*, and 6=*(almost) every day*. The good psychometric properties (e.g., factorial validity, reliability, convergent and divergent validity) of the ZBBS in the current sample have been demonstrated in the previous study (see Murray et al., 2019, for details). This study separately evaluated the effects of general and sexual bullying victimization, as the sexual victimization item showed low loading on the general victimization scale based on the validation results of Murray et al. (2019). In the current analyses, omega coefficients for the general victimization scale were .79 (age 13), .74 (age 15), .77 (age 17), and .72 (age 20).

The rationale for the use of a ‘past month’ timeframe for suicidal ideation and D-SIB and past year for bullying victimization related to the original goal of the z-proso temporal design to be able to provide a plausible time ordering for risk factors (e.g., victimization which used a ‘past year’ reference frame) and outcomes (e.g., suicidal ideation and D-SIB which used a ‘past month’ reference frame) even when using data from within the same wave. However, as

discussed above there is reason to hypothesize that the relations between these constructs are in fact, bidirectional. Further, with the use of longitudinal modeling, especially that which examines the associations between within-person deviations from a person's own baseline on these two constructs, the use of a plausible temporal sequence is provided by the ordering of the measurement waves. In these models, measurements of suicidal ideation/D-SIB, and victimization at each wave reflect the current recent tendency to experience these events/symptoms, where the time reference period can differ. In this case the use of a shorter reference frame for suicidal ideation/D-SIB versus bullying victimization remains appropriate given that bullying refers to a by definition a chronic, repetitive behavior, therefore, it is more appropriate to measure how often participants experienced these events over a longer time scale. Participants who experienced a low past-year frequency would thus not be considered to have experienced high levels of bullying victimization by this definition. On the other hand, recalling suicidal ideation/D-SIB over a previous month timescale is likely to be more reliable than a recall period of a whole year.

Statistical analyses

Four separate RI-CLPMs (Hamaker et al., 2015) were fit. Specifically, considering data availability, the associations of general (M1) and sexual (M2) bullying victimization with suicidal ideation were examined between ages 15 and 20. In addition the relations between general (M3) and sexual (M4) victimization with D-SIB were evaluated between ages 13 and 20. In each model, the within-person level parameters (i.e., autoregressive paths, within-time covariances, and cross-lagged paths) and between-person level parameters (i.e., random intercept factors and their covariance) were included. Gender differences were adjusted for by

regressing random intercept factors on gender in the whole sample analyses to adjust for gender. In exploratory analyses, we also separately fit models for males and females in the four RI-CLPMs mentioned above to explore gender differences. Monte Carlo power analyses (see <https://osf.io/kba94/>) suggested that the sample was likely adequate to detect moderate-sized effects in gender-specific models but the power to detect small effects depended on the partitioning of the between- and within-person variance. Models were estimated in Mplus 8.0 (Muthén & Muthén, 2015) using robust maximum likelihood estimation (MLR). This considered acceptable over a categorical estimator because items were on 5- or 6-point scales (Rhemtulla et al. 2012). Model fit was deemed acceptable if CFI and TLI were close to or above 0.90 and RMSEA and SRMR were less than 0.08 (e.g., Hu & Bentler, 1999).

Results

Raw Pearson correlations among all variables are provided in Table S1 of supplementary materials and were majority positive and statistically significant. The correlation matrices among study variables at the between- and within-person levels are shown in Tables S2-S5 (see supplementary materials). Tables S6-S7 of supplementary materials present the RI-CLPM parameters and fit statistics. All RI-CLPM models in the whole sample and gender-specific samples fit well, except for the model examining general victimization and D-SIB relations in the female-specific analyses. For the suicidal ideation models (Figures 1 and 2), general bullying victimization at age 15 predicted within-person increases in suicidal ideation at age 17 in the overall sample ($\beta=.10, p=.022$), but this was non-significant for both males and females when stratifying analyses by gender. There was also a positive

within-person effect of age 17 suicidal ideation on age 20 general victimization ($\beta=.14$, $p=.015$); again, this effect was not significant for either males or females based on gender-specific analyses. Sexual bullying victimization at age 17 predicted within-person decreases in suicidal ideation at age 20 in the overall sample ($\beta=-.10$, $p=.014$), but when stratifying by gender was significant only in the male sample ($\beta=-.12$, $p=.012$).

Concerning D-SIB (see Figures 3 and 4), although not seen in the overall sample, gender-specific analyses suggested that males' D-SIB at ages 15 and 17 predicted within-person decreases in general victimization at ages 17 ($\beta=-.30$, $p=.014$) and 20 ($\beta=-.15$, $p=.004$), respectively. Male-specific analyses indicated a significant negative within-person effect of age 17 sexual victimization on age 20 D-SIB ($\beta=-.13$, $p=.016$); however, in the overall sample, this effect was only marginally significant ($\beta=-.09$, $p=.050$).

The within-time covariances represent within-person cross-sectional associations. Significant positive within-time covariances between general victimization and suicidal ideation were found at ages 15, 17, and 20, respectively, in both the overall and gender-specific samples. In addition, age 13 general and sexual victimization were positively related to age 13 D-SIB in the overall, male, and female samples. In the overall sample at age 15, there were positive associations between sexual victimization and suicidal ideation/D-SIB. In the male-specific analyses, age 17 general victimization was negatively associated with age 17 D-SIB. In the female-specific sample, age 20 general victimization was positively related to age 20 D-SIB.

Discussion

This study examined the bidirectional, within-person relations between bullying

victimization and suicidal ideation/D-SIB in adolescence and emerging adulthood, using the RI-CLPMs to separate between- and within-person effects. We found a positive within-person effect of age 15 general bullying victimization on age 17 suicidal ideation; thus, youth at age 15 suffering from an escalation in the frequency of peer victimization are more likely to report more frequent suicidal ideation (relative to their typical frequency) at age 17. This finding corroborates many previous findings reflecting between-person effects or the mixture of the between- and within-person effects (e.g., Brunstein Klomek et al., 2019). Notably, this positive within-person effect was limited to middle to late adolescence but not to early adulthood. From the research design perspective, the non-significant result in emerging adulthood may be that a long-term time-lag failed to capture effects of general victimization on suicidal ideation that occur over shorter timescale. From the developmental perspective, a possible explanation is that peer-related interpersonal relationships are more paramount in adolescence, and youth are more emotionally reactive to stressors generated by peer interactions (see Prinstein, & Giletta, 2016, for a review). Future research employing shorter lags can help disentangle these possibilities.

Results also suggested that suicidal ideation at age 17 was positively related to within-person increases in general victimization at age 20, indicating that a higher-than-usual frequency of suicidal ideation at age 17 can lead to more frequent than typical exposure to general victimization at age 20. These results are consistent with the stress generation model, and a possible explanation is that some characteristics associated with suicidality such as deficiencies in social problem solving and emotion regulation (Law et al., 2015; Speckens & Hawton, 2005) and cognitive vulnerabilities (e.g., thwarted belongingness; Joiner, 2005) can

lead to the occurrence of stressful interpersonal events. Another possible explanation for this finding is that suicidal ideation is also closely associated with other internalizing problems, particularly depression (a sign of ‘weakness’) (e.g., Orri et al., 2020), which may make a young person seem to be an easy target for bullying (Brunstein Klomek, et al. 2019).

Additionally, this within-person effect occurred at an important transition to adulthood when fraught with novel stressors (e.g., new financial responsibilities, making their way into the workforce), which is another susceptible time concerning the development of mental health problems, including suicidality (Arnett et al., 2014). At this stage, severe mental difficulties such as suicidal ideation may cascade into the interpersonal relationship domain.

The above-noted findings were not replicated in the exploratory gender-stratified analyses, likely due to lower power. Further, in these analyses several counter-intuitive findings that cannot be easily explained by exiting theories were found in males: Age 17 sexual harassment victimization was associated with *decreases* in age 20 suicidal ideation/D-SIB, and D-SIB at ages 15 and 17 predicted within-person *decreases* in general bullying victimization at ages 17 and 20, respectively. Future research using within-person models and larger sample sizes will be important to assess whether these results replicate.

In addition to the above-described long-term effects, we also found some significant ‘cross-sectional’ correlations between these constructs at the within-person level. Specifically, at ages 15, 17, and 20, the positive relations between general victimization and suicidal ideation were found both in the whole and gender-specific samples. Moreover, at age 13, both general and sexual victimization were positively related to D-SIB in the overall, male, and female samples; at age 15, there was a positive association between sexual harassment and

suicidal ideation/D-SIB in the overall sample, but positive long-term cross-lagged effects among these constructs were not supported. Two inconsistent within-time covariances were found between gender. In the male-specific analyses, age 17 general victimization was negatively associated with age 17 D-SIB, but, at age 20, the positive relation between general victimization and D-SIB was found in female-specific analyses. This gender difference might indicate that females are more susceptible to interpersonal difficulties than males (e.g., Natsuaki et al., 2009). Again, the negative association showed in male youth should be replicated in future studies with larger samples given that there were very few males reporting D-SIB. Collectively, these findings might suggest that the risk associations shared by bullying victimization and suicidal ideation/self-injury are more likely to occur concurrently or within a short period, suggesting a benefit to examining their associations on short time-lags.

This study, identifying within-person relations controlling for between-person differences, provides insights into associations between bullying victimization and suicidal ideation/D-SIB from the developmental perspective, thereby better informing the development of interventions targeting specific change mechanisms. Our results suggest, for example, that there would be benefits to ongoing monitoring of victimization and suicidality to capture within-person fluctuations in these experiences and indicate high-risk periods. These findings also indicate that more integrated anti-bullying and suicide intervention and prevention programs could enhance their effectiveness. Furthermore, long-term pathways from general bullying victimization to suicidal ideation and from suicidal ideation to general victimization occurred at different periods (i.e., the middle and late adolescence, and the

transition to adulthood, respectively), pointing to optimal timing of the delivery of intervention/prevention to address the long-lasting deleterious effects of peer victimization or suicidality.

Limitations and Future Directions

The limitations of this study bear noting. First, given z-proso is a large, longitudinal community-based sample project, our measures of suicidal ideation, D-SIB, and sexual victimization were limited to single items. Nevertheless, single-item measures have been considered a validated source for such sensitive questions, and they can reduce response burden, which is especially needed and widely used in large-scale population-based research (e.g., Donath et al., 2019; Perret et al., 2020). Still, future research using more comprehensive questionnaires might provide higher sensitivity and a more nuanced picture of suicidal ideation and D-SIB relations with bullying victimization (including both general and sexual victimization). Second, due to previous demonstrations of a lack of gender invariance in the ZBBS (Murray et al., 2019) we were only able to explore gender differences by descriptive comparison. Future studies using scales that satisfy gender measurement invariance to test gender effects rigorously would help provide further information on gender moderation effects. Third, although our findings may contribute to a better understanding effects of victimization on suicidal ideation/D-SIB from the long-term developmental perspective, the follow-up lengths of this study were relatively long. Future studies with shorter time intervals might provide crucial information on the immediate effects of bullying victimization on suicidality/self-injury and vice versa (Eisner & Malti, 2015). Finally, this study may also be limited to using different time frames to assess bullying victimization and suicidal ideation

/D-SIB (i.e., the last year and last month), leading to potential difficulties in interpreting within-time parameters in terms of temporal order, as these results reflected both concurrent and short-term time-lag effects.

Conclusion

This study made an important advance in isolating within-person processes from potential confounding influences of between-person associations to evaluate the developmental dynamics between bullying victimization and suicidal ideation/D-SIB in adolescence and early adulthood. Findings of long-term cross-lagged effects suggest that general bullying victimization influences suicidal ideation between middle and late adolescence, and that suicidal ideation in late adolescence can lead to the increases in general bullying victimization in emerging adulthood. Our results thus point to optimal targets and time-points for intervention in addressing exposure to victimization and suicidality. Findings of within-time covariances over and above the cross-time effects indicate that future studies with short-term time-lag can yield nuanced information to better detect immediate effects of bullying victimization on suicidality/self-injury (and vice versa).

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Figure 1 RI-CLPM for general bullying victimization and suicidal ideation in the overall/male/female sample

Note. GBVic=General Bullying Victimization; SI=Suicidal Ideation. The values in bold represent statistically significant paths at least at $p < .05$.

Figure 2 RI-CLPM for sexual bullying victimization and suicidal ideation in the overall/male/female sample

Note. SBVic=Sexual Bullying Victimization; SI=Suicidal Ideation. The values in bold represent statistically significant paths at least at $p < .05$.

Figure 3 RI-CLPM for general bullying victimization and D-SIB in the overall/male/female sample

Note. GBVic=General Bullying Victimization; D-SIB=Direct Self-Injurious Behavior. The values in bold represent statistically significant paths at least at $p < .05$.

Figure 4 RI-CLPM for sexual bullying victimization and D-SIB in the overall/male/female sample

Note. SBVic=Sexual Bullying Victimization; D-SIB=Direct Self-Injurious Behavior. The values in bold represent statistically significant paths at least at $p < .05$.

Key points

- Extensive research has documented bullying victimization associated with suicidality and self-injury.
- However, the modeling approaches used have mostly not addressed the relations between these constructs at the within-person level, which are critical for testing developmental theories and guiding intervention efforts.
- Results indicated that, at the within-person level, general bullying victimization and suicidal ideation can have detrimental effects on each other over developmental time but at different stages, pointing to optimal timing of the delivery of the intervention to address the long-lasting deleterious effects between them.
- Findings also indicate that future studies employing short-term assessments can yield nuanced information to better detect the immediate effects of bullying victimization on suicidality/self-injury (and vice versa).

Table S1

Pearson correlations among study variables

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1. Age 13 D-SIB	—														
2. Age 15 D-SIB	.25***	—													
3. Age 17 D-SIB	.18***	.35***	—												
4. Age 20 D-SIB	.09**	.16***	.31***	—											
5. Age 15 Suicidal Ideation	.25***	.49***	.30***	.12***	—										
6. Age 17 Suicidal Ideation	.23***	.22***	.47***	.21***	.41***	—									
7. Age 20 Suicidal Ideation	.11***	.17***	.29***	.48***	.23***	.40***	—								
8. Age 13 Sexual BV	.21***	.14***	.08**	.05	.16***	.10***	.01	—							
9. Age 15 Sexual BV	.07*	.19***	.10***	.02	.18***	.09**	.02	.37***	—						
10. Age 17 Sexual BV	.07*	.10***	.13***	.01	.11***	.14***	-.01	.27***	.38***	—					
11. Age 20 Sexual BV	.09**	.15***	.14***	.09**	.11***	.11***	.08**	.18***	.33***	.43***	—				
12. Age 13 General BV	.19***	.08**	.08**	.10**	.18***	.19***	.08**	.16***	.04	.08**	.01	—			
13. Age 15 General BV	.12***	.12***	.08**	.02	.20***	.17***	.08**	.07*	.14***	.09**	.04	.48***	—		
14. Age 17 General BV	.06	.08**	.07*	.06	.13***	.20***	.11***	.02	.06*	.11***	.03	.37***	.48***	—	
15. Age 20 General BV	.05	.10**	.06*	.17***	.11***	.17***	.28***	.01	.05	.07*	.12***	.28***	.30***	.42***	—

Note. D-SIB=Direct Self-Injurious Behavior; Sexual BV=Sexual Bullying Victimization, General BV=General Bullying Victimization; * $p < .05$; ** $p < .01$; *** $p < .001$.

Table S2

Correlations among general bullying victimization and suicidal ideation at the between- and with-person levels

	1	2	4	5	6	7	8	9
Between-person correlations								
1. RI_General BV	—							
2. RI_Suicidal Ideation	.28	—						
3. Gender	-.08	.28***	—	—	—	—	—	
Within-person correlations								
4. Age 15 Suicidal Ideation	—	—	—					
5. Age 17 Suicidal Ideation	—	—	.32***	—				
6. Age 20 Suicidal Ideation	—	—	.10**	.31***	—			
7. Age 15 General BV	—	—	.19***	.15***	.06*	—		
8. Age 17 General BV	—	—	.10*	.19***	.08	.33***	—	
9. Age 20 General BV	—	—	.06*	.16**	.29***	.07 ($p = .05$)	.17	—

Note. RI=Random-Intercept; General BV=General Bullying Victimization; * $p < .05$; ** $p < .01$; *** $p < .001$.

Table S3

Correlations among sexual bullying victimization and suicidal ideation at the between- and with-person levels

	1	2	4	5	6	7	8	9
Between-person correlations								
1. RI_Sexual BV	—							
2. RI_Suicidal Ideation	.39*	—						
3. Gender	.53***	.28***	—	—	—	—	—	
Within-person correlations								
4. Age 15 Suicidal Ideation	—	—	—					
5. Age 17 Suicidal Ideation	—	—	.32***	—				
6. Age 20 Suicidal Ideation	—	—	.10**	.31***	—			
7. Age 15 Sexual BV	—	—	.12*	.02	-.01	—		
8. Age 17 Sexual BV	—	—	.00	.07	-.07	.10	—	
9. Age 20 Sexual BV	—	—	.01	.03	.03	.01	.13	—

Note. RI=Random-Intercept; Sexual BV=Sexual Bullying Victimization; * $p < .05$; ** $p < .01$; *** $p < .001$.

Table S4

Correlations among general bullying victimization and self-injury at the between- and with-person levels

	1	2	4	5	6	7	8	9	10	11
Between-person correlations										
1. RI_General BV	—									
2. RI_D-SIB	.38**	—								
3. Gender	-.07*	.28***	—	—	—	—	—	—	—	—
Within-person correlations										
4. Age 13 D-SIB	—	—	—							
5. Age 15 D-SIB	—	—	.19**	—						
6. Age 17 D-SIB	—	—	.05*	.28***	—					
7. Age 20 D-SIB	—	—	.01	.05*	.20*	—				
8. Age 13 General BV	—	—	.18***	.03	.01	.00	—			
9. Age 15 General BV	—	—	.09*	.08*	.04	.00	.35***	—		
10. Age 17 General BV	—	—	.03	.03	.00	-.03	.10***	.28***	—	
11. Age 20 General BV	—	—	.00	-.01	-.02	.10	.00	.01	.04	—

Note. RI=Random-Intercept; D-SIB=Direct Self-Injurious Behavior; General BV=General Bullying Victimization; * $p < .05$; ** $p < .01$; *** $p < .001$.

Table S5

Correlations among sexual bullying victimization and self-injury at the between- and with-person levels

	1	2	4	5	6	7	8	9	10	11
Between-person correlations										
1. RI_Sexual BV	—									
2. RI_D-SIB	.44**	—								
3. Gender	.57***	.28***	—	—	—	—	—	—	—	—
Within-person correlations										
4. Age 13 D-SIB	—	—	—							
5. Age 15 D-SIB	—	—	.18**	—						
6. Age 17 D-SIB	—	—	.05*	.27***	—					
7. Age 20 D-SIB	—	—	.01	.05*	.20*	—				
8. Age 13 Sexual BV	—	—	.20***	.09	.02	.00	—			
9. Age 15 Sexual BV	—	—	.03	.14*	.03	-.01	.22***	—		
10. Age 17 Sexual BV	—	—	.00	.01	.06	-.07	.04	.18**	—	
11. Age 20 Sexual BV	—	—	.00	.02	.06	.01	.01	.04	.22**	—

Note. RI=Random-Intercept; D-SIB=Direct Self-Injurious Behavior; Sexual BV=Sexual Bullying Victimization; * $p < .05$; ** $p < .01$; *** $p < .001$.

Table S6

RI-CLPM standardized parameters for bullying victimization and suicidal ideation

Parameter	Overall sample (<i>n</i> =1465)			Males (<i>n</i> =757)			Females (<i>n</i> =708)		
	Estimate	SE	<i>p</i>	Estimate	SE	<i>p</i>	Estimate	SE	<i>p</i>
M1: General Bullying Victimization (Model Fit [Overall/Males/Females]: CFI=.98/1.00/1.00, TLI=.92/1.02/.98, RMSEA=.04/.00/.03, SRMR=.02/.01/.01)									
Autoregressive parameters									
Suicidal Ideation age 20 on Suicidal Ideation age 17	.30	.06	<.001	.26	.10	.008	.34	.08	<.001
Suicidal Ideation age 17 on Suicidal Ideation age 15	.30	.06	<.001	.29	.10	.004	.30	.09	<.001
General BV age 20 on General BV age 17	.14	.09	.117	.12	.13	.329	.16	.14	.264
General BV age 17 on General BV age 15	.32	.05	<.001	.33	.06	<.001	.31	.08	<.001
Cross-lagged parameters									
Suicidal Ideation age 20 on General BV age 17	.03	.04	.518	.03	.06	.614	.04	.07	.576
Suicidal Ideation age 17 on General BV age 15	.10	.04	.022	.11	.07	.105	.10	.06	.081
General BV age 20 on Suicidal Ideation age 17	.14	.06	.015	.14	.09	.103	.15	.08	.061
General BV age 17 on Suicidal Ideation age 15	.03	.04	.387	.06	.06	.288	.03	.06	.659
Within-time parameters									
Suicidal Ideation age 20 with General BV age 20	.25	.06	<.001	.25	.07	<.001	.27	.10	.009
Suicidal Ideation age 17 with General BV age 17	.14	.04	.001	.15	.06	.017	.15	.06	.020
Suicidal Ideation age 15 with General BV age 15	.19	.04	<.001	.28	.05	<.001	.15	.06	.018
Between-person parameter									
General BV with Suicidal Ideation	.32	.16	.044	.01	.24	.954	.50	.24	.033

M2: Sexual Bullying Victimization (Model Fit [Overall/Males/Females]: CFI=.97/1.00/1.00, TLI=.90/1.13/1.04, RMSEA=.05/.00/.00, SRMR=.02/.00/.01)									
Autoregressive parameters									
Suicidal Ideation age 20 on Suicidal Ideation age 17	.31	.06	<.001	.26	.10	.007	.36	.07	<.001
Suicidal Ideation age 17 on Suicidal Ideation age 15	.32	.06	<.001	.32	.10	.001	.32	.08	<.001
Sexual BV age 20 on Sexual BV age 17	.13	.09	.141	-.14	.36	.705	.18	.09	.042
Sexual BV age 17 on Sexual BV age 15	.10	.09	.227	.00	.19	1.000	.14	.09	.131
Cross-lagged parameters									
Suicidal Ideation age 20 on Sexual BV age 17	-.10	.04	.014	-.12	.05	.012	-.09	.06	.127
Suicidal Ideation age 17 on Sexual BV age 15	-.02	.04	.621	.01	.06	.894	-.03	.06	.629
Sexual BV age 20 on Suicidal Ideation age 17	.03	.05	.592	-.05	.07	.477	.05	.06	.368
Sexual BV age 17 on Suicidal Ideation age 15	-.01	.05	.865	-.10	.06	.090	.03	.07	.611
Within-time parameters									
Suicidal Ideation age 20 with Sexual BV age 20	.04	.05	.477	-.02	.07	.788	.07	.07	.284
Suicidal Ideation age 17 with Sexual BV age 17	.08	.05	.099	.05	.07	.490	.10	.06	.091
Suicidal Ideation age 15 with Sexual BV age 15	.12	.06	.045	.16	.10	.097	.11	.07	.115
Between-person parameter									
Sexual BV with Suicidal Ideation	.30	.19	.116	.32	.25	.193	.22	.24	.359

Note. General BV=General Bullying Victimization, Sexual BV=Sexual Bullying Victimization. The values in bold represent statistically significant paths ($p<.05$).

Table S7

RI-CLPM standardized parameters for bullying victimization and D-SIB

Parameter	Overall sample (<i>n</i> =1482)			Males (<i>n</i> =765)			Females (<i>n</i> =715)		
	Estimate	SE	<i>p</i>	Estimate	SE	<i>p</i>	Estimate	SE	<i>p</i>
M3: General Bullying Victimization (Model Fit [Overall/Males/Females]: CFI=.98/1.00/.96, TLI=.95/1.02/.88, RMSEA=.03/.00/.05, SRMR=.02/.02/.03)									
Autoregressive parameters									
D-SIB age 20 on D-SIB age 17	.20	.08	.012	.15	.14	.298	.22	.11	.039
D-SIB age 17 on D-SIB age 15	.27	.06	<.001	.18	.12	.140	.30	.07	<.001
D-SIB age 15 on D-SIB age 13	.19	.06	.002	.09	.09	.316	.26	.08	.001
General BV age 20 on General BV age 17	.04	.08	.651	-.11	.15	.443	.07	.11	.506
General BV age 17 on General BV age 15	.28	.05	<.001	.28	.06	<.001	.25	.08	.001
General BV age 15 on General BV age 13	.34	.04	<.001	.34	.05	<.001	.33	.05	<.001
Cross-lagged parameters									
D-SIB age 20 on General BV age 17	-.03	.05	.477	-.12	.07	.081	.03	.08	.674
D-SIB age 17 on General BV age 15	.02	.04	.732	.03	.09	.699	.00	.05	.944
D-SIB age 15 on General BV age 13	.00	.04	.981	-.08	.05	.106	.07	.05	.175
General BV age 20 on D-SIB age 17	-.02	.06	.725	-.30	.12	.014	.07	.08	.366
General BV age 17 on D-SIB age 15	.00	.04	.918	-.15	.05	.004	.10	.06	.095
General BV age 15 on D-SIB age 13	.03	.03	.377	.06	.05	.199	.01	.05	.816
Within-time parameters									
D-SIB age 20 with General BV age 20	.11	.06	.064	.02	.12	.896	.15	.07	.034
D-SIB age 17 with General BV age 17	-.01	.05	.825	-.16	.06	.004	.06	.08	.401
D-SIB age 15 with General BV age 15	.07	.04	.083	.06	.05	.287	.08	.05	.136
D-SIB age 13 with General BV age 13	.18	.04	<.001	.22	.06	<.001	.13	.06	.030
Between-person parameter									
General BV with D-SIB	.42	.14	.002	.62	.24	.009	.30	.17	.073

M4: Sexual Bullying Victimization (Model Fit [Overall/Males/Females]: CFI==.97/1.00/.98, TLI=.93/1.07/.94, RMSEA=.03/.00/.03, SRMR=.03/.03/.03)									
Autoregressive parameters									
D-SIB age 20 on D-SIB age 17	.20	.08	.010	.19	.13	.148	.21	.10	.035
D-SIB age 17 on D-SIB age 15	.27	.06	<.001	.21	.12	.087	.29	.07	<.001
D-SIB age 15 on D-SIB age 13	.17	.06	.004	.09	.09	.356	.24	.08	.003
Sexual BV age 20 on Sexual BV age 17	.22	.07	.001	.08	.20	.694	.24	.07	.001
Sexual BV age 17 on Sexual BV age 15	.18	.07	.006	.11	.13	.383	.21	.08	.007
Sexual BV age 15 on Sexual BV age 13	.23	.06	<.001	.11	.08	.185	.28	.08	<.001
Cross-lagged parameters									
D-SIB age 20 on Sexual BV age 17	-.09	.04	.050	-.13	.05	.016	-.08	.06	.206
D-SIB age 17 on Sexual BV age 15	-.01	.05	.881	-.05	.07	.480	.01	.06	.864
D-SIB age 15 on Sexual BV age 13	.06	.05	.226	-.06	.06	.291	.11	.07	.098
Sexual BV age 20 on D-SIB age 17	.05	.04	.248	-.03	.06	.628	.06	.05	.239
Sexual BV age 17 on D-SIB age 15	-.01	.04	.791	-.06	.09	.521	.00	.05	.972
Sexual BV age 15 on D-SIB age 13	-.01	.05	.779	-.03	.06	.614	.00	.07	.977
Within-time parameters									
D-SIB age 20 with Sexual BV age 20	.02	.05	.678	.06	.08	.479	.00	.06	.949
D-SIB age 17 with Sexual BV age 17	.06	.04	.168	.10	.10	.319	.04	.05	.354
D-SIB age 15 with Sexual BV age 15	.12	.05	.012	.17	.09	.061	.09	.06	.088
D-SIB age 13 with Sexual BV age 13	.20	.04	<.001	.15	.07	.037	.23	.06	<.001
Between-person parameter									
Sexual BV with D-SIB	.35	.19	.060	.58	.39	.133	.30	.21	.152

Note. D-SIB=Direct Self-Injurious Behavior; General BV=General Bullying Victimization, Sexual BV=Sexual Bullying Victimization. The values in bold represent statistically significant paths ($p<.05$).