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Peer victimization and anxiety during COVID-19 pandemic: disentangling between and within person effects

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Abstract

Peer victimization and anxiety are consistently positively correlated, though the longitudinal relationship remains inconsistent. Previous research often failed to account for the reciprocal relationship between traditional and cyber victimization, with limited evidence of the influence of broader societal factors. Thus, the present study aimed to longitudinally examine the relationship between victimization, cyber victimization, and anxiety within the specific context of the COVID-19 pandemic during one school year (2021/22), employing both the cross-lagged panel model and the random-intercept cross-lagged panel model. The study included 1766 students (58.5% females; M_{age}= 15.33; SD=1.20) from lower- and upper-secondary schools in Slovenia who participated in three time-points with approximately 8 weeks apart, with T1 occurring before school closures, T2 during school closures (which lasted 17–21 weeks), and T3 after school closures. Findings revealed that the relationship between anxiety and victimization changed across the school year. The results of the cross-lagged panel model indicated that traditional victimization in T1 positively predicted anxiety in T2, and anxiety in T2 positively predicted traditional victimization in T3. Cyber victimization at T2 predicted lower anxiety at T3. The results of the random-intercept cross-lagged panel model showed that t the within-person level, students experiencing more cyber victimization than expected reported greater subsequent victimization, especially after school closures. The study provides insights into the dynamics of the relationship between peer victimization and anxiety during a specific period of school closure. The findings do not fully align with any single theoretical model, highlighting the complexity of these interactions in the pandemic context. This study underscores the need to consider broader socio-environmental factors in understanding the relationship between peer relationships and psychosocial outcomes.

Keywords Victimization · Cyber victimization · Anxiety · Middle adolescents · Longitudinal study · School closure

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1 Introduction

Peer relationships play a pivotal role in shaping the emotional landscape of adolescents, serving as sources of both joy and distress throughout the schooling years. Particularly during adolescence, experiences within peer contexts significantly impact students' well-being. Among the most detrimental experiences within these contexts is bullying victimization (Juvonen & Graham, 2014). Bullying occurs in peer interactions across all settings where adolescents interact. During the COVID-19 pandemic, as measures were taken to prevent the virus's spread, these interactions largely moved online. The present study thus focuses on cyber victimization alongside overall victimization. The importance of preventing bullying victimization is often justified by its consequences (e.g., Copeland et al., 2013; Halliday et al., 2021). The most common consequences of victimization are internalizing symptoms (for a review, see Guzman-Holst & Bowes, 2021), primarily manifesting as depression or anxiety– the latter being in the focus of the present study. Internalizing symptoms can be both antecedents and consequences of peer victimization, indicating a bidirectional relationship. While various explanatory pathways have been proposed, the precise mechanisms driving this reciprocal relationship remain unclear. Most research examining the nature of the relationship between internalizing symptoms and peer victimization has focused on participants in middle childhood or early adolescence and in a longer timeframe (for a review, see Christina et al., 2021; Guzman-Holst & Bowes, 2021, Halliday et al., 2021). Both main constructs of the current research - victimization and anxiety - are prone to change under the influence of macro-level contextual factors. More specifically, the COVID-19 pandemic has influenced both anxiety (Erbiçer et al., 2022) and peer victimization (Vaillancourt et al., 2021, 2023)– and likely their relationship as well. Thus, the aim of the present study is to examine the relationship between victimization, cyber victimization, and anxiety within the specific context of the COVID-19 pandemic during one school year. This relationship will be examined using cross-lagged panel model, and further explored by disentangling between-person effects from within-person effects through using a random-intercept cross-lagged panel model, allowing for the investigation of within-person fluctuations from the expected values over time. The findings from the present research thus aim to contribute to a better understanding of the relationship between anxiety and peer victimization, especially cyber victimization as prevalent during the COVID-19 pandemic, since the longitudinal relationship between cyber victimization and anxiety was not thoroughly studied (Holfeld & Mishna, 2019). Moreover, the study adds to the current knowledge by including a sample of middle adolescents, individual-level predictors (i.e., gender and age), and broader socio-ecological circumstances (i.e., the COVID-19 pandemic).

1.1 Peer victimization and anxiety: relationship models

The experience of victimization, characterized by an experience of power imbalance as a target of aggressive peer behavior (Volk et al., 2017), represents a significant social stressor shaping students' self-perceptions and peer interactions. Victims of bullying in adolescence have consistently been found to exhibit higher risks for inter-

nalizing problems in early and middle adulthood (Copeland et al., 2013; Ttofi et al., 2011). Internalizing symptoms refer to various emotional difficulties, from low self-concept to symptoms of depression and anxiety. Unlike students with externalizing symptoms, students with internalizing symptoms do not exert a direct influence on the surrounding environment, which allows them to often go unnoticed for extended periods (Guzman-Holst & Bowes, 2021).

One of the most prevalent internalizing symptoms and mental health challenges during adolescence is anxiety (Neil & Christensen, 2009), which is a natural response to perceived threats manifesting through cognitive, physiological, and behavioral responses (Abramowitz & Blakey, 2020). Research suggests a bidirectional relationship between anxiety, or broader internalizing symptoms, and peer victimization, proposing three potential models (for a review, see Guzman-Holst & Bowes, 2021).

According to the *interpersonal risk model*, experiencing peer victimization leads to anxiety. Negative experiences in peer relationships foster a negative cognitive bias, which, along with physiological mediators, results in a state of constant alertness for threatening situations– an anxious response. Given that peer relationships during adolescence significantly shape self-perception, this direction of association is expected to be stronger during adolescence than in earlier developmental periods, which research predominantly confirms (e.g., Stapinski et al., 2015). The *symptom-driven model* suggests the opposite direction of association; anxious adolescents are at higher risk of experiencing peer victimization. Socially withdrawn and anxious individuals are more prone to social isolation, making them easy targets for peers seeking to assert dominance within the peer group. It is also possible that students with higher levels of anxiety are more likely to perceive some unambiguous peer situations as victimization or to experience a power imbalance in the relationship (Fekkes et al., 2006). This direction of association is also quite well documented in the literature (e.g., Holfeld & Mishna, 2019; Vaillancourt et al., 2013). The *transactional model* proposes a reciprocal relationship between anxiety and peer victimization. According to this model, adolescents are in constant interaction with their social environment, leading to various developmental outcomes; anxiety and victimization are reciprocally connected over time. This model seems most congruent with the contemporary understanding of peer victimization dynamics, suggesting that adolescents displaying greater vulnerability are the easiest targets for bullying perpetrators. As bullies exert more influence on bystanders, victims become increasingly socially isolated. Consequently, they suffer not only from bullying but also from social isolation and lack of support within the classroom. This situation can enhance characterological self-blaming attributions, further exacerbating distress and anxiety and perpetuating victimization (Juvonen & Schacter, 2017).

Most studies that investigated the relationship between anxiety and victimization were cross-sectional and confirmed the concurrent association between the variables (for a meta-analytic review, see Hawker & Boulton, 2000). In meta-analyses of longitudinal studies examining the relationship between internalization symptoms and peer victimization, both directions of association were reported (Christina et al., 2021; Reijntjes et al., 2010); the effects were small to moderate, as expected, given the multifaceted nature of both victimization and internalization symptoms. In addi-

tion, both directions of association were found to be of approximately equal strength (Christina et al., 2021).

Although these meta-analyses provide strong empirical support for the assumption of bidirectional associations, longitudinal studies with only two measurement points are less accurate in assessing the longitudinal sequence of association between anxiety and victimization. Both meta-analyses of longitudinal studies (Christina et al., 2021; Reijntjes et al., 2010) included some studies with more than two measurement points, but only two measurements were included in the analyses. A few studies included three or more measurement points, enabling the use of cross-lagged models (Chu et al., 2019; Drazdowski et al., 2021; Holfeld & Mishna, 2019; Lester, 2012; Sentse, 2017; Zhou et al., 2024). The transactional model of the relationship between anxiety and peer victimization was confirmed using a cross-lagged model with four measurement points over a three-year period (Lester et al., 2012). The direction of association was stronger during the transition from primary to secondary education, with victimization as an antecedent and anxiety as a consequence. In addition, consistent with a transactional model, in a cross-lagged twin study, Morneau-Vaillancourt et al. (2023) found that emotional symptoms predicted increases in social isolation and peer victimization at later time points and that, in turn, social isolation and peer victimization independently contributed to emotional symptoms over time. They also reported that social isolation in middle adolescence partly explained the long-term link between peer victimization in early adolescence and emotional problems in late adolescence. On the other hand, some of the findings were more in line with the symptom-driven model (Chu et al., 2019; Drazdowski et al., 2021; Holfeld & Mishna, 2019).

Furthermore, gender differences in the nature of relationship between victimization and anxiety were inconsistently reported. Although some studies found gender-specific longitudinal relationships between victimization and anxiety (e.g. Sentse et al., 2017; Stapinsky et al., 2015; Vuik et al., 2007) gender did not emerge as a significant moderator of the relationship between victimization and internalization symptoms in any direction of association in meta-analyses (Christina et al., 2021; Reijntjes et al., 2010). Similarly, age was not found to significant moderate the relationship between anxiety and victimization (see, e.g., Christina et al., 2021) Nevertheless, the relationship between victimization and anxiety in middle adolescence, when both phenomena manifest differently than in earlier developmental periods, is poorly understood since most studies were conducted on samples of children or early adolescents. The present study aims to fill this gap.

1.2 Traditional vs. cyber-victimization in relation to anxiety

Research also suggests that the relationship between victimization and anxiety varies for different forms of victimization, with anxiety predicting cyber but not physical or relational victimization (Forbes et al., 2019). Similarly, meta-analyses revealed that internalizing symptoms predict cyber victimization more strongly than traditional victimization (Reijntjes et al., 2010) and, furthermore, that the relationship between anxiety and victimization was stronger for online (compared to traditional) victimization for both directions of association (Christina et al., 2021).

The conceptualization of cyberbullying and cyber victimization in relation to the traditional forms of bullying and victimization is a topic of ongoing debate. According to one perspective, called the *extension hypothesis*, cyberbullying is considered a form of bullying with similar predictors and consequences (e.g., depression, anxiety). Conversely, the *differences hypothesis* argues that while there are overlaps, cyberbullying is incrementally different from traditional bullying because of its online exclusivity (Barlett et al., 2024). While studies indicate a substantial overlap between cyber and traditional victimization (see, e.g., Kowalski et al., 2014), the degree of this overlap likely determines the unique relations of both forms of victimization with other variables.

Research examining the relationship between victimization and anxiety has included both forms of victimization (although cyber victimization has been less studied), but not always controlled for each other when investigating the unique relationships of both victimization forms to anxiety. In the meta-analysis that investigated the relationships between cyber-victimization and internalizing problems controlling for the occurrence of traditional victimization, Gini et al. (2018) found that both forms have unique relations with internalizing problems and that that traditional victimization was more strongly related to internalizing problems than cyber-victimization. Holfeld & Mishna (2019) examined the longitudinal association sequences between cyber victimization and internalizing symptoms across three academic years controlling for traditional victimization; their data aligned better with a symptoms-driven model than interpersonal risk or transactional models.

In the present study, both forms of victimization were tested simultaneously to control for each other in the relationship with anxiety in a timeframe of one school year. This seems particularly relevant in the context of limited face-to-face peer interactions due to the COVID-19 measures, which are likely to have influenced the relationship between traditional and cyber victimization as well as their relation to anxiety. In the case of traditional victimization, we focused on verbal and relational victimization while excluding physical victimization, which is not characteristic of middle adolescence (Yeager et al., 2015).

1.3 Anxiety and victimization in the context of COVID-19 measures

The current study was conducted during the 2020/21 school year amidst the second and third waves of the COVID-19 pandemic. In that time, measures that aimed to prevent the spread of the virus significantly impacted adolescents' lives. Slovenia experienced one of the longest school closures among EU countries during the peak of the COVID-19 pandemic in 2020–2021 (UNESCO, n.d.). This study was conducted before, during, and after the second school closure, which, for the population of students examined in this study, lasted between 17 and 21 weeks, depending on the educational program. In addition to school closures, the Slovenian government implemented further measures, including restrictions on movement between regions and municipalities, mandatory mask-wearing in public spaces, and limitations on outdoor gatherings to no more than six individuals. As a result, all school and extracurricular activities were canceled or moved online.

Studies (e.g., Deng et al., 2023; Panchal et al., 2023) have shown a significant effect of the COVID-19 pandemic on adolescents' mental health, including elevated levels of anxiety (Erbiçer et al., 2022; Garthe et al., 2023). During school closures, adolescents did not interact with their peers in schools, extracurricular activities, or events, leading to higher loneliness levels (Houghton et al., 2022). In addition, approximately one-third of adolescents in Slovenia reported they did not feel like contacting friends during this time (Klemenčič Mirazchiyski et al., 2021). Research that examined bullying during the COVID-19 pandemic does not provide consistent conclusions, as some authors reported a decline in bullying (Garthe et al., 2023), especially during the initial school closure period (e.g. Repo et al., 2023), while other studies documented an increase in bullying (e.g., Forsberg & Thorvaldsen, 2022; Patchin & Hinduja, 2023; Xie et al., 2023).

Findings from the REDS survey (Klemenčič Mirazchiyski et al., 2021), assessing the educational disruption caused by the pandemic during the first wave, indicated that 53% of Slovenian youth reported increased levels of loneliness during school closures, while about half of them experienced higher levels of anger than usual. Moreover, 39% had sleeping difficulties compared to before the pandemic, approximately 60% reported worries about changes in schooling and how school closures would impact their learning and future education, and 72% referred to missing their classmates. Thus, during the pandemic, adolescents experienced changes in anxiety triggers as well as in the ways of entering into peer relationships; it is reasonable to assume that these changes also influenced the nature of the relationship between anxiety and victimization. Among studies that investigated the specifics of adolescents' mental health issues during the COVID-19 pandemic, Garthe et al. (2023) investigated bidirectional associations between cyber-victimization and mental health issues in early adolescents. They found that higher cyber-victimization before the pandemic was associated with significant increases in anxiety, depression, and social stress during the pandemic. The present study further sheds light on the relationship between the two measures, simultaneously including traditional and cyber-victimization in the specific context of the COVID-19 pandemic.

1.4 Current study

In the current study, the nature of the relationship between peer victimization (traditional and cyber) and anxiety was longitudinally examined in a sample of middle adolescents. Using data from three measurements over a school year (8-month interval), three theoretical models of the relationship between victimization, cyber victimization, and anxiety (i.e., the interpersonal risk model, the symptom-driven model, and the transactional model) were tested by employing both a cross-lagged panel model (to assess the relationship between variables over time) and a random-intercept cross-lagged panel model (to evaluate within-person variations). The cross-lagged panel model assesses how overall individual differences at one point predict differences at later points, while the random intercept cross-lagged panel model separates stable traits from within-person fluctuations, offering a more nuanced understanding of changes over time. Furthermore, the role of gender and age was taken into account. Drawing upon previous research, we expected to find support specifically for the

transactional model of the relationship between victimization and anxiety. However, due to the unique circumstances under which the study was conducted, it also took on an exploratory character.

The study took place during the 2021/22 school year, a period in which students were distance-schooled for a large portion of the year. Data were collected at three measurement points: just before school closure (T1), during approximately three months of distance schooling (T2), and after students returned to in-person classes (T3). These specific circumstances likely influenced changes in anxiety and both forms of victimization over the course of the school year, as well as the relationship between them. Consequently, although the confirmation of the transactional model was initially hypothesized, the study remained partly exploratory in nature. By adopting a longitudinal research design, utilizing a large sample of middle adolescents, and accounting for the reciprocal relationship between traditional and cyber victimization, the present research offers insights into the dynamic relationship between victimization and anxiety during a school year characterized by macro-level factors that significantly shaped adolescents' psychosocial functioning.

2 Method

2.1 Participants

The overall sample of students who participated in at least one time point was 2,231 students whose parents or caregivers gave a consent to participate in a study; 1874 students participated in T1 (83.9% response rate), 1770 students participated in T2 (79.3% response rate), and 1720 students participated in T3 (77.1% response rate). The reasons they did not participate were mostly due to not being present in school (e.g., illness). However, the analyses included only those who participated and completed at least two measurements and had less than 20% missing values for each construct within each time point. The final sample of the present study included 1766 students (58.5% females, 41.4% males, 0.1% non-binary) from lower- and upper-secondary schools in Slovenia, aged between 13 and 19 years old (M_{age} = 15.33; SD = 1.20).

2.2 Instruments

2.2.1 Victimization

The Adolescent Peer Relations Instrument: Bully/Target (APRI-BT; Marsh et al., 2011) was utilized to assess traditional (verbal and relational) victimization. This questionnaire measures several forms of both bullying and victimization; however, in the present study, only two forms of victimization were examined. The whole scale comprises 36 items, with 18 items dedicated to bullying and 18 to victimization, including six items for each subdomain (i.e., physical, verbal, and relational). The sample item for verbal victimization is "I was teased by students saying things to me." and the sample item for relational victimization is "A student wouldn't be

friends with me because other people didn't like me." Participants rated the frequency of these behaviors during the current school year on a 6-point scale (1 = never, 6 = every day). The Slovenian adaptation has demonstrated excellent reliability, with Cronbach's alpha value of 0.92 for victimization (Košir et al., 2020). The reliability of the scale in the present study was excellent (0.92 to 0.96).

2.2.2 Cyber victimization

A Revised Version of Adolescent Peer Relations Instrument: Bully-Target; RAPRI-BT; Griezel et al., 2012) was used, which was furtherly revised (i.e., some items were modified, combined or dropped) based on the 2019 Cyberbullying Survey (e.g., Košir et al., 2022). In the present study, only the items related to cyber victimization were used. The revised version of the questionnaire includes six items measuring cyber victimization (e.g., "In the last month, a student forwarded a video message to my mobile phone they knew I wouldn't like.", "In the last month, a student sent me an instant chat message to hurt my feelings."). Participants reported on a 6-point Likert scale ranging from *1* = never to *6* = every day. In the present study, the reliabilities of the scales were good despite the inclusion of only six items (0.81 to 0.94).

2.2.3 Anxiety

The Anxiety Scale for Children and Adolescents (Lestvica anksioznosti za otroke in mladostnike; Kozina, 2012) was used to measure anxiety in school setting. This scale comprises 14 items, such as "I worry a lot," and "I find it hard to relax." where participants indicated the frequency of these statements being true for them over the past month on a Likert scale ranging from *1* = never to *5* = always. The instrument's reliability and validity have been thoroughly established for Slovenian students (Kozina, 2012), and in our study, Cronbach's alpha ranged from 0.91 to 0.93, indicating high internal consistency in all time points.

2.3 Procedure

The data that were used in the present study were collected in the research project *Positive Youth Development in Slovenia: Developmental Pathways in the Context of Migration.* Sampling was conducted at two levels to focus on lower- and upper-secondary schools with a higher number of migrant students requiring additional Slovene language instruction. The first group included lower- and upper-secondary schools with fewer (or no) migrant students needing additional Slovene instruction. These schools were randomly sampled, while the number of schools per type depended on the data from the Statistical Office of the Republic of Slovenia (SURS, 2024). Thus, three general schools (approximately 35% of students attended this program), four technical secondary schools (47%), two vocational schools (17%), and one short vocational school (2%) were invited. In upper-secondary school, two classes per grade were randomly sampled, while all 9th-grade classes participated in lower-secondary schools. In the second group, lower-secondary schools with more than 16 students attending additional Slovene language classes and upper-second-

ary schools with more than 160 approved additional Slovene hours per year were included. From these schools, ten lower-secondary and upper-secondary schools with higher numbers of migrant students, as well as ten upper-secondary and lower-secondary schools with lower numbers of migrant students, were selected.

Prior to data collection, the local ethics committee approved the research project, and parental consent was obtained. The data were collected three times during a school year, with an approximate interval of 8 weeks between each collection. The data collection process was significantly impacted by the COVID-19 pandemic. The first data collection wave took place in October, November, and December 2020. Participants initially completed paper-pencil questionnaires in school, but due to the worsening epidemiological situation, the process transitioned entirely online. Lower-secondary students engaged in remote learning from October 19, 2020, to February 12, 2021 (17 weeks). Upper-secondary students in general, technical, and vocational programs learned remotely from October 19, 2020, to March 5, 2021 (21 weeks), after which they followed a hybrid model. Students in short vocational programs also learned remotely from October 19, 2020, to February 12, 2021 (17 weeks). As a result, the second wave of data collection, which occurred from January to March 2021, was entirely online. The third wave of data collection took place from May to June 2021, both online and on paper. All students returned to remote learning from April 1 to April 9, 2021, during the third wave of the pandemic. Completing the questionnaire took approximately 30 to 45 min, supervised by school coordinators either in person or online.

2.4 Data analysis

Statistical analyses were performed using IBM Statistics 29.0 and Mplus 8.6. Initially, missing data analysis was performed on participants who completed at least two measurements and had less than 20% missing values for each construct within each measurement. Little's MCAR test (Little, 1988) was used to test whether the missing data were randomly distributed. This showed a statistically significant Little's MCAR test, χ^2 (3996) = 6509.20, $p < 0.001$. However, the normalized chi-square was acceptable ($\chi 2/df = 1.63$), indicating that the data were missing at random. Accordingly, maximum likelihood with robust standard errors was employed in the Mplus to handle the missing data.

Given the nested nature of the data (1766 students in 128 classes in 40 schools), intraclass correlation coefficients (ICCs) were examined. Most of the ICCs for study variables in each timepoint were low (victimization: $ICCs_{school} \leq 0.084$, $ICCs_{class} \leq 0.031$; cyber victimization: $ICCs_{school} \leq 0.080$, $ICCs_{class} \leq 0.068$; anxiety: $ICCs_{school} \leq 0.058$, $ICCs_{class} \leq 0.024$). Since most of the ICCs were at or below the suggested cutoff of 0.05 (LeBreton & Senter, 2008) and the four largest ICCs were below 0.10, which is still considered acceptable for individual-level analyses (Peugh, 2010), the analyses were conducted at the individual level to focus on self-reported characteristics.

Prior to the main analyses, longitudinal measurement invariance was conducted for each study variable. The fit indices used were CFI > 0.95, RMSEA < 0.05, and SRMR < 0.05 for a good fit, while values of CFI > 0.90, RMSEA < 0.08, and SRMR < 0.08 indicate a satisfactory fit (Hair et al., 2019). Metric invariance was

determined using changes in ΔCFI ≤ 0.010, ΔRMSEA ≤ 0.015, and SRMR (for metric invariance: ΔSRMR ≤ 0.030 and scalar invariance: ΔSRMR ≤ 0.010) (Chen, 2007; Cheung & Rensvold, 2002).

To explore the longitudinal relationships between victimization, cyber victimization, and anxiety, two methods were employed: the cross-lagged panel model and the random intercept cross-lagged panel model. The cross-lagged panel model assesses how individual differences at one time point relate to differences at subsequent time points (undecomposed individual differences). In contrast, the random intercept cross-lagged panel model distinguishes stable traits (decomposed individual differences) from within-person deviations over time. Using both methods is theoretically and methodologically sound (Marsh et al., 2022). A cross-lagged panel model was used to explore longitudinal relationships among the study variables at the level of undecomposed individual differences (Lüdtke & Robitzsch, 2022). The analysis assesses how the effects of differences between individuals in constructs relate to differences between individuals in constructs at subsequent time points (Marsh et al., 2022). When including at least three measurement points, it is recommended to consider lag-2 stability coefficients (Lüdtke & Robitzsch, 2022; Orth et al., 2021); thus, lag-2 paths were added between the first and third-time points for each construct.

Furthermore, to examine longitudinal relationships at the level of decomposed individual differences, the random intercept cross-lagged panel model (Hamaker et al., 2015) was used. This model distinguishes between stable differences between individuals and actual processes within individuals over time by calculating expected values for each construct based on the sample's average values across three measurements. Each latent variable in this model is divided into a stable trait and a current state at each time point, examining if deviations from an individual's average value in one construct affect deviations in another construct within an individual. For example, it reveals if higher-than-expected values of victimization predict higher-than-expected values of anxiety within an individual. The within-person level comprises autoregressive paths (such as the effect of victimization at T1 on victimization at T2), cross-lagged paths (e.g., victimization at T1 on anxiety at T2), covariances between variables in T1 (e.g., victimization at T1 with anxiety at T1), and the residual covariances of the variables at T2, T3, and T4.

Gender was included in the model as a time-invariant predictor of latent factors for the cross-lagged panel model and as a time-invariant predictor of the random intercept of each variable in the random-intercept cross-lagged panel model. The analyses began with assessing an unconstrained model (Model 1) in which all auto-regressive and cross-lagged paths were freely estimated. After that, auto-regressive constraints (Model 2), cross-lagged constraints were added (Model 3), auto-regressive and cross-lagged paths were added (Model 4), and a fully constrained model with auto-regressive and cross-lagged constraints and time-invariant (co)variances (Model 5) were added. Models were compared using AIC and BIC, with the models with the lowest AIC and BIC being selected as the most appropriate (Mulder & Hamaker, 2021).

3 Results

3.1 Preliminary analyses

Descriptive statistics and correlations among variables are reported in Table S1 in the supplementary materials. The cross-sectional and longitudinal associations between victimization and cyber victimization are moderate and positive. While victimization and anxiety are cross-sectionally and longitudinally weakly positively correlated (except for victimization in T2 and anxiety in T3, which are not correlated), cyber victimization and anxiety are positively weakly correlated mainly cross-sectionally with some exceptions (e.g., cyber victimization in T2 and anxiety in T3 are negatively weakly correlated).

For all included study variables, longitudinal measurement invariance was tested, and scalar invariance was established for each one of them. Results of the tests of measurement invariance are included in Table S2 in the supplementary materials.

3.2 Cross-lagged panel model

Before selecting the final cross-lagged panel model, several models with lag-2 were run to ensure the selection of the most parsimonious model (see Table 1). In model 1, both autoregressive and cross-lagged paths were allowed to vary over the school year. The model showed an adequate fit. In model 2, which was also adequate, only autoregressive paths were constrained to be equal, and cross-lagged paths were allowed to vary over time. In model 3, the autoregressive paths were freed, and cross-lagged paths were equal over time. In model 4, both autoregressive and cross-lagged paths were constrained to be equal. After that, AICs and BICs of all models were compared. Model 1 with unconstrained paths was selected as the most appropriate model since it had the lowest values of both AIC and BIC among all models.

The results of the selected cross-lagged panel model are presented as standardized estimates in Fig. 1. Victimization, cyber victimization, and anxiety were positively concurrently correlated in each timepoint, though the strength of the associations between victimization and anxiety, as well as cyber victimization and anxiety, varied

Table 1 Model fit statistics for cross-lagged panel model with gender and age as time-invariant predictors

Model	Model fit					Model fit comparison	
	S-Bχ^2	df	CFI	RMSEA [90% CI]	SRMR	AIC	BIC
Model 1: Unconstrained	1.5482	4522	0.902	0.029 [0.028–0.030]	0.050	281606.59	283384.45
Model 2: Constrained autoregressive	1.5509	4528	0.900	0.029 [0.028–0.030]	0.058	281868.46	283613.60
Model 3: Constrained cross-lagged	**1.5496**	**4528**	**0.903**	**0.029 [0.028–0.030]**	**0.051**	**281602.30**	**283347.44**
Model 4: Fully constrained	1.5527	4534	0.900	0.029 [0.029–0.030]	0.060	281882.01	283594.43

Note. CFI - comparative fit index, CI - confidence interval, RMSEA - root mean square error of approximation, AIC– Akaike information criteria, BIC– Bayesian information criteria, best fitted model is bolded

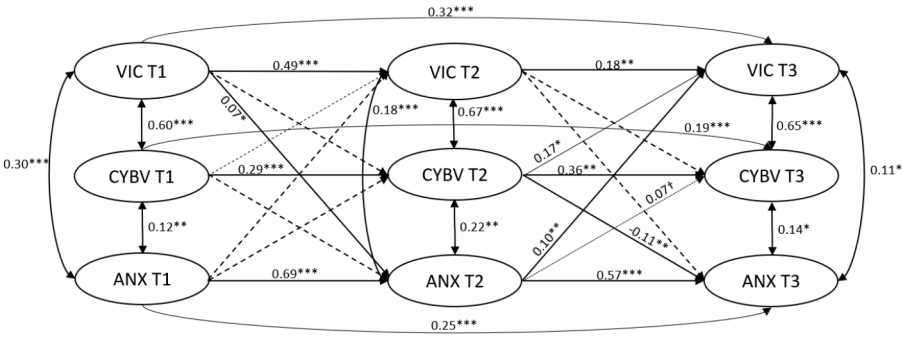

Fig. 1 Cross-lagged panel model for victimization, cyber victimization, and anxiety with gender and age as time-invariant predictors of latent factors in each timepoint. Note. The latent factors and observed variables are not presented due to simplicity. Results for gender as a time-invariant predictor of all latent factors in each timepoint are presented in Table 3. VIC– victimization, CYBV– cyber victimization, ANX– anxiety. *$p<0.05$; **$p<0.01$; ***$p<0.001$

over time. At T1, at the beginning of the school year, the correlation between victimization and anxiety was higher compared to the same relationship in T2 and T3. The correlation between cyber victimization and anxiety was the highest in T2 compared to T1 and T3.

The autoregressive paths for each variable were positive and significant, indicating the stability of rank-order differences between participants for all study variables over the school year. Regarding the cross-lagged paths, victimization significantly positively predicted anxiety from T1 to T2, while anxiety significantly positively predicted victimization from T2 to T3. These findings mean that higher levels of victimization than other students lead to a subsequent rank-order increase in anxiety and vice versa. Further, cyber victimization negatively significantly predicted anxiety from T2 to T3, indicating that higher cyber victimization results in a subsequent rank-order decrease in anxiety. There was also a marginally significant cross-lagged path from anxiety at T2 to cyber victimization at T3, showing that higher anxiety at T2 contribute to higher cyber victimization at T3. Interestingly, there was only one cross-lagged significant path between victimization and cyber victimization, suggesting that higher levels of cyber victimization lead to higher victimization at T3.

3.3 Random intercept cross-lagged panel model

Since CLPM does not allow for examination of person-level fluctuations in the study variables, an additional RI-CLPM was conducted to control for between-person stable traits in order to examine within-person differences over time. Similar to CLPM, several models were tested to select the best-fitting model (see Table 2). Although all models demonstrated a good fit, a comparison of AICs and BICs values suggested model 3 according to AICs and model 4 according to BICs. Thus, model 4 was selected as the most parsimonious model to assess the relationship between victimization, cyber victimization, and anxiety.

The standardized results of the RI-CLPM with the time-invariant predictors gender and age of random intercepts and constrained cross-lagged paths are presented

Table 2 Model fit statistics for random-intercept cross-lagged panel model with gender as a time-invariant predictor

Model	Model fit					Model fit comparison	
	S-Bχ^2	df	CFI	RMSEA [90% CI]	SRMR	AIC	BIC
Model 1: Unconstrained	1.5481	4526	0.901	0.029 [0.029–0.030]	0.052	281787.91	283543.95
Model 2: Constrained autoregressive	1.5490	4529	0.901	0.029 [0.029–0.030]	0.053	281804.95	283544.64
Model 3: Constrained cross-lagged	**1.5497**	**4532**	**0.901**	**0.029 [0.029–0.030]**	**0.053**	**281783.43**	**283506.75**
Model 4: Fully constrained	1.5509	4535	0.901	0.029 [0.029–0.030]	0.054	281800.28	283507.25

Note. CFI - comparative fit index, CI - confidence interval, RMSEA - root mean square error of approximation, AIC– Akaike information criteria, BIC– Bayesian information criteria, best fitted model is bolded

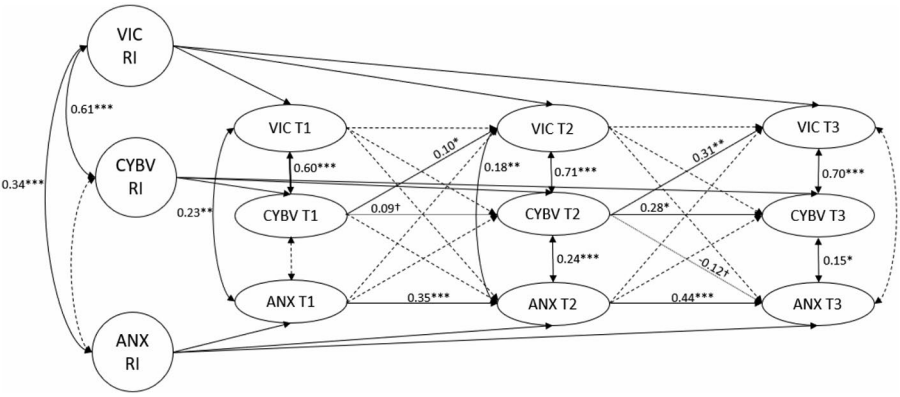

Fig. 2 Random intercept cross-lagged panel model for victimization, cyber victimization, and anxiety with gender and age as time-invariant predictors of random intercepts. Note. The latent factors and observed variables are not presented due to simplicity. Results for gender as a time-invariant predictor of all latent factors in each timepoint are presented in Table 3. VIC– victimization, CYBV– cyber victimization, ANX– anxiety, RI– random intercept. †$p<0.010$; *$p<0.05$; **$p<0.01$; ***$p<0.001$

in Fig. 2. At the between-person level (decomposed individual differences), random intercepts of victimization and cyber victimization, as well as random intercepts of victimization and anxiety, are positively significantly correlated. This means that students who reported higher victimization also had higher anxiety during the school year and that students with higher cyber victimization also experienced higher levels of victimization.

At the within-person level, concurrent correlations between victimization and cyber victimization indicate that students who reported higher levels of victimization than expected had higher cyber victimization than expected at the same time point. The concurrent correlations between victimization and anxiety changed over the school year since students who had higher victimization than their personal norm also had higher anxiety than expected in T1 and T2 and vice versa; however, no sig-

Table 3 Standardized coefficients of gender as a time-invariant predictor in CLPM on factor variables and in RI-CLPM on random intercepts

	CLPM		RI-CLPM	
	β	SE	β	SE
Victimization T1	-0.06*	0.03		
Cybervictimization T1	-0.11***	0.02		
Anxiety T1	0.37***	0.02		
Victimization T2	-0.15***	0.03		
Cybervictimization T2	-0.16***	0.03		
Anxiety T2	0.09***	0.02		
Victimization T3	-0.08**	0.03		
Cybervictimization T3	-0.06*	0.03		
Anxiety T3	0.08***	0.02		
Victimization RI			-0.14***	0.03
Cybervictimization RI			-0.22***	0.05
Anxiety RI			0.46***	0.03

*$p<0.05$; **$p<0.01$; ***$p<0.001$. Gender was coded as 0 = boy, 1 = girl, 2 = non-binary

nificant relationship between victimization and anxiety was found at T3. Conversely, cyber victimization and anxiety were not related in T1, while they were significantly positively correlated at T2 and T3, suggesting that students with higher anxiety reported higher cyber victimization at T2 and T3 than expected and vice versa.

Furthermore, the within-person carry-over effects were only present for anxiety throughout the school year, indicating that students with elevated anxiety scores at one wave as expected reported elevated anxiety scores as expected in the next wave. Cyber victimization showed the carry-over effect from T2 to T3 and a marginally significant carry-over effect from T1 to T2, meaning that students who experienced more cyber victimization as expected reported higher levels of cyber victimization than expected in the subsequent waves.

As for within-person cross-lagged effects, students with higher levels of cyber victimization than expected were likely to report higher victimization than expected throughout the school year. Furthermore, the effect of cyber victimization on victimization was stronger from T2 to T3 than from T1 to T2. Moreover, a marginally significant effect of cyber victimization on anxiety appeared, suggesting that students who experienced higher levels of cyber victimization at T2 than expected were likely to report lower levels of anxiety than expected at T2.

3.4 Gender and age as time-invariant predictors

In both CLPM and RI-CLPM, gender was included as a time-invariant predictor. The results are presented in Table 3. Boys exhibited higher levels of victimization and cyber victimization during the school year than girls throughout the school year. On the other hand, girls reported higher levels of anxiety than boys over the school year, but the effect of gender was more pronounced at the beginning of the school year compared to the middle and the end of the school year. Statistically significant effects of age were found only for victimization at T1 and for random intercept of victimization. Results showed that younger students reported higher levels of victimization at T1 and at a level of decomposed individual differences. Furthermore, there was a marginal statistical effect of age on cyber victimization at T1 and on the random

intercept ($ps < 0.10$), suggesting that younger students reported more cyber victimization at T1 and on the level of decomposed individual differences. As for anxiety, there was only a marginally significant effect of age on the random intercept, indicating that on the trait level, older students experienced higher anxiety levels.

4 Discussion

The aim of the present study was to contribute to a better understanding of the complex interplay between victimization and anxiety during middle adolescence. The added value of the study is accounting for the reciprocal relationship between traditional and cyber victimization. Additionally, the contribution of gender and age was considered, and the study as a whole was placed in the broader socio-environmental influence of the COVID-19 pandemic. The results indicate that this specific socio-environmental context very likely largely influenced the relationship between anxiety and peer victimization, particularly the relationship between anxiety and cyber victimization, which is further presented and discussed below.

4.1 Relationship between victimization and anxiety

Anxiety and both forms of victimization were uniquely related over the school year, reflecting a combination of between-person differences and within-person changes over time. Initially, traditional victimization had a stronger concurrent relationship with anxiety compared to cyber victimization. However, during the middle of the school year—when students were distance schooled for some months —cyber victimization became more strongly associated with anxiety than traditional victimization. This pattern persisted even after students returned to school, though the difference was smaller. These findings highlight the role of macrosystem and chronosystem factors, as defined in the bioecological model of human development (Bronfenbrenner & Morris, 2006), in shaping the relationship between adolescents and their contexts. During school closures, with limited face-to-face interactions, online peer interactions became a primary means of maintaining relationships, which probably contributed to a stronger association between cyber victimization and anxiety. Furthermore, the relationship between traditional and cyber victimization grew stronger with each measurement, starting from a magnitude already higher than in previous studies (e.g., Gini et al., 2018). This may be attributed to the timing of the initial measurement, which occurred during the pandemic following students' first experience of school closure.

Consistent with previous research (Lee & Vaillancourt, 2018; Singham et al., 2017), stronger concurrent relationships between both forms of victimization and anxiety were found compared to lagged outcomes. In addition, the study also found that victimization at the beginning of the school year was a stronger predictor of victimization at the end of the school year compared to the victimization measure during the school year, while cyber victimization and anxiety measured during the school closure predicted cyber victimization at the end of the school year more strongly than cyber victimization and anxiety measured at the beginning of the school year. These

findings suggest that school closures had an ongoing effect on online victimization. Furthermore, higher anxiety during the school closures persisted even when students returned to school.

The cross-lagged relationships observed partly align with both the *interpersonal risk model* and the *symptom-driven model* since traditional victimization at the beginning of the school year positively predicted anxiety in the middle of the school year, while anxiety in the middle of the school year positively predicted traditional victimization at the end of the school year. Although - contrary to our assumptions - the results do not fully validate the transaction model, this suggests a reciprocal relationship between victimization and anxiety, possibly demonstrated as a vicious circle where more victimized students became more anxious, increasing their vulnerability to further victimization at the end of the school year. Inconsistent with previous studies that consistently reported positive concurrent and longitudinal relationships between both traditional and cyber victimization and anxiety (for a review, see Guzman-Holst & Bowes, 2021), also in the run-up to and during a pandemic (Garthe et al., 2023), cyber victimization in the middle of school year negatively predicted anxiety at the end of the school year. This may be due to the specific nature of peer relationships during school closures, when online interactions could be avoided more easily than in-person interactions. Results from some studies examining students' experiences during the school closures due to the Covid-19 pandemic (e.g., Klemenčič Mirazchiyski et al., 2021) reported that some students were completely excluded (or excluded themselves) from peer interactions during the school closures. These students thus avoided cyber victimization but reported higher anxiety upon returning to school. Additionally, anxiety during school closures predicted increased cyber victimization afterward, likely due to heightened vulnerability of students, consistent with the symptom-driven model. In contrast to the findings of Garthe et al. (2023), cyber victimization in the initial measurement before school closures did not predict anxiety levels during the closures. However, in the Garthe et al. (2023) study, the initial measurement occurred pre-pandemic, whereas in the current study, it took place during the pandemic when students were back in school but had already experienced their first closure which could contribute to the inconsistencies.

Overall, the effects observed in this study were small, comparable in magnitude for both directions of association, and consistent with recent meta-analyses on longitudinal relationships between victimization and internalizing symptoms (Christina et al., 2021). However, these effects were smaller than those reported in meta-analyses (Christina et al., 2021; Reijntjes et al., 2010).

4.2 Relationship between victimization and anxiety at the within-person level

Results of the RI-CLPM suggested that random intercepts of traditional victimization and anxiety were positively related. However, there was no significant correlation between cyber victimization and anxiety at the trait level. As expected, the random intercepts of traditional victimization and cyber victimization were strongly positively correlated. When looking at the within-person level or, more specifically, deviations from the expected values, results suggested that the concurrent correlation between traditional victimization and anxiety at the beginning of the school year

is higher than the concurrent relationship between cyber victimization and anxiety. In the middle of the school year, the opposite was true– anxiety was more strongly related to cyber victimization. Further, at the end of the school year, traditional victimization and anxiety were not correlated at all, suggesting that deviations in traditional victimization were not related to deviations in anxiety and vice versa. This is not consistent with some other studies conducted in the normative period (without COVID-19 restrictions) that have used RI-CLPM and reported higher-than-usual scores in peer victimization being unidirectionally and positively associated with subsequent higher-than-usual scores in internalizing symptoms (Liang et al., 2024).

There was a carry-over effect during the school year for cyber victimization and anxiety, suggesting that COVID-19 circumstances may have increased the likelihood of experiencing either cyber victimization or anxiety during the school year. Without further examination, this finding reflects the challenging situation students were in since their anxiety and cyber victimization increased after school closures. Regarding the cross-lagged paths, students who experienced higher cyber victimization than expected had higher victimization in the subsequent waves; this impact of cyber victimization was stronger after the school closures, suggesting that online victimization spilled over to face-to-face victimization. Furthermore, since there was no between-individual correlation between cyber victimization and anxiety traits, it is evident that the results on the within-person level confirm that the (marginally significant) negative influence of cyber victimization on anxiety was due to not engaging in online interactions if students were more anxious.

The results of the RI-CLPM thus indicate considerable stability of both forms of victimization as well as anxiety across the school year despite extraordinary macrosystem-level factors. This is consistent with previous studies as anxiety has also proved to be quite stable; Leikanger and Larsson (2012) reported a developmental pattern of stable scores in a one-year period. Similar was found for victimization, both over a period of a few years (Cillessen & Lansu, 2015) and over a period of one year (Pouwels et al., 2016). However, cyber victimization has proved less stable in previous studies (see, e.g., Garthe et al., 2023; Grandinger et al., 2012). Additional evidence of within-person stability is that for the RI-CLPM, the best-fitting model was the one where the relationships were consistent over time. In contrast, for the CLPM, the best-fitting model was the unconstrained one. The relationship between victimization and anxiety was thus more dynamic on a construct level than a within-person level.

The effects on a construct level and within-person level were mostly congruent and do not fully support any of the three models of the anxiety-victimization relationship that have been tested since inconsistent significant cross-lagged relationships were found in both directions. However, the findings provide insights into the dynamics of the relationship between peer victimization and anxiety during a specific period of school closure. This specific aspect of the chronosystem was a significant game-changer since it influenced the macro and microsystems that determine students' development as well as their interactions (i.e., mesosystem). The experience of being an adolescent at the time of the COVID-19 pandemic was specific; this context affected not only the experience of anxiety and peer victimization but also the nature of the relationship between them (Deng et al., 2023; Houghton et al., 2022; Panchal

et al., 2023). Future research should examine whether being an adolescent in the time of the COVID-19 pandemic is also reflected in long-term outcomes related to the experience of anxiety and peer victimization and the relationship between them.

4.3 The role of gender and age

Gender and age differences were examined in both CLPM and RI-CLPM. Consistent with previous studies on gender differences in various types of victimization (e.g., Cook et al., 2010) and anxiety (e.g., Farhane-Medina et al., 2022), boys reported higher victimization and cyber victimization, whereas girls reported higher anxiety. Interestingly, these gender differences were larger at the beginning of the school year compared to the middle and end of the school year. It could be speculated that this was partly due to measures related to COVID-19 restrictions since a recent meta-analysis (Ludwig-Walz et al., 2023) found that during the pandemic, the increase in general anxiety symptoms was higher in male adolescents. In addition, younger students reported higher victimization and cyber victimization at the beginning of the school year, while older students experienced higher levels of anxiety.

4.4 Limitations and further directions

This research has thus shed light on the nature of the relationship between anxiety and peer victimization (traditional and cyber) in middle adolescence in the specific context of the COVID-19 measures that dramatically changed adolescents' everyday lives. However, when interpreting the findings, it is also important to bear in mind the limitations of this study. Due to the specific time context of the study, the results of the current study also do not allow for generalizable conclusions on whether the form of peer victimization determines the relationship between victimization and anxiety. Indeed, the strength of the association between anxiety and both forms of victimization also changed at the level of concurrent correlations, most likely due to the closure of schools, which allowed peer contact only in online environments. In addition, all data were obtained using self-report measures, which may lead to common method bias (Podsakoff et al., 2003); some studies suggest that effects are smaller when victimization is assessed using peer nomination measures. While the longitudinal research design of the present study provides insight into the direction of the relationship between anxiety and victimization, it should be borne in mind that even longitudinal studies with three measures do not allow causal inferences to be made about the relationships between variables. On a minor note, using only victimization measures, we were not able to differentiate between students high in victimization and those high in both victimization and bullying (bully-victims). It is possible that the relationship between victimization and anxiety differs for these two groups of students. Another minor shortcoming is the relatively short time interval; although we have captured well the year when most of the changes due to the COVID measures took place, it would have been useful to look at longer-term trends, as rates were fairly stable over the eight-month interval. Nonetheless, the findings provide a foundation for further investigation into the nuanced dynamics of anxiety and peer

victimization during adolescence, particularly in the context of significant societal changes.

In order to better understand the nature of the relationship between victimization and anxiety, it would be worthwhile for future research to examine possible mediators of this relationship. Some research of this kind is already yielding promising results; for example, Peets et al. (2022) report that rumination mediates the relationship between victimization and internalizing symptoms.

4.5 Conclusion

The current study provides insights into the complex relationship between peer victimization and anxiety during middle adolescence, particularly within the unique context of the COVID-19 pandemic. The findings suggest that the specific socio-environmental factors surrounding influenced the dynamics between anxiety and peer victimization. Notably, unique associations between anxiety and victimization were observed at different measurement waves, highlighting the fluctuating nature of this relationship over time, especially in the context of school closures and online peer interactions. Of particular note is the relationship between cyber victimization during school closures and anxiety at the end of the school year when students were back in school as more cyber-victimized in the middle of school year reported less anxiety at the end of the school year. Higher cyber victimization during school closure thus probably at least partly reflects higher involvement in peer interactions during this period, when peer interactions could also be avoided. The results partially support all three models of the proposed nature of the relationships since some evidence for both directions of association was found, indicating that the closure of schools and increased online peer communication during the pandemic may have played a role in shaping these dynamics. However, the findings do not align fully with any single theoretical model tested, indicating the complexity of these interactions within the pandemic context. This study emphasizes the importance of considering broader socio-environmental factors in understanding the interplay between peer relationships and psychosocial outcomes. The COVID-19 pandemic has highlighted how external factors can profoundly impact adolescents' experiences and relationships, shaping the nature of anxiety and peer victimization.

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Data availability The datasets generated and/or analyzed during the current study are not publicly available but are available from the corresponding author on reasonable request.

Declarations

Ethical approval The study was approved by the local ethics committee at the Faculty of Arts, University of Maribor.

Informed consent Informed consent was obtained from the parents or legal guardians of all participants, and assent was obtained from the participating adolescents.

Conflict of interest The authors report no conflict of interests.

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