Trajectories of Peer Victimization and Their Associations with Depressive Symptoms and Externalizing Problems: Co-enhancement or Risk Susceptibility?

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Abstract

Adopting a longitudinal design, this study conducted four waves of tracking measurements on 1580 students in fourth grade, first year of middle school, and first year of high school to examine the change trajectory of peer victimization from Wave 1 to Wave 3 and its group heterogeneity, and to explore how the initial level and rate of change in peer victimization jointly influenced depressive emotions and externalizing problems at Wave 4. The results showed that: (1) The change trajectory of peer victimization exhibited a linear decreasing pattern, and the decreasing trend demonstrated heterogeneity across different migration statuses. Specifically, migrant children, left-behind children, and rural children all exhibited higher initial levels of peer victimization than urban children, with migrant children and left-behind children showing a faster rate of decline than urban children; (2) After controlling for demographic factors and baseline levels of depressive emotions and externalizing problems, the effects of the initial level and rate of change in peer victimization on depressive emotions operated through a stress-sensitization pattern, whereas on externalizing problems, they operated through a stress-enhancement pattern. These findings indicate that the effects of the initial level and rate of change in peer victimization on depressive emotions and externalizing problems are distinct, suggesting that future prevention/intervention research should develop targeted programs tailored to different problem behaviors to effectively improve intervention efficacy.

Full Text

Peer Victimization Trajectories and Their Relationships with Depressive Symptoms and Externalizing Problems: Risk Enhancement or Risk Susceptibility?

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Abstract

This longitudinal study examined peer victimization (PV) trajectories from Time 1 to Time 3 and their heterogeneity across subgroups in a sample of 1,580 students from fourth grade, seventh grade, and tenth grade who completed four waves of measurement. We investigated how the initial level and rate of change in PV jointly predicted depressive symptoms and externalizing problems at Time 4, after controlling for demographic factors and baseline levels of these outcomes. Results indicated: (1) PV exhibited a linear decreasing trajectory, with significant heterogeneity across groups based on migration status. Specifically, rural-to-urban migrant children, left-behind children, and rural children all showed higher initial PV levels than urban children, with migrant and left-behind children demonstrating faster rates of decline; (2) After controlling for covariates, the initial level and rate of change in PV influenced depressive symptoms through a stress-sensitization pattern, whereas they affected externalizing problems through a stress-amplification pattern. These findings demonstrate that the initial level and rate of change in PV have distinct effects on depressive symptoms versus externalizing problems, suggesting that prevention and intervention efforts should be tailored to specific problem behaviors to enhance effectiveness.

Keywords: peer victimization, trajectory, depressive symptoms and externalizing problems, stress sensitization, stress amplification

Peer victimization has emerged as a significant public health concern in China and globally (Barzilay et al., 2017). Peer victimization refers to repeated and intentional aggressive behaviors perpetrated by peers, encompassing physical, verbal, relational, and property victimization (Ma et al., 2019). Multiple large-scale national surveys have consistently documented the prevalence of peer victimization among adolescents (Chen et al., 2018; Zhang et al., 2019; Zhu et al., 2020). For instance, one study of 18,452 adolescents found that 71.8% had experienced victimization in the past year, with 44.3% experiencing chronic victimization (Zhu et al., 2020). Extensive research has demonstrated that peer victimization severely impacts depressive symptoms and externalizing problems (Hawker & Boulton, 2000; Reijntjes et al., 2010, 2011), with these adverse effects

persisting for decades (Takizawa et al., 2014).

However, previous research has primarily examined the independent effects of the initial level and rate of change in peer victimization on depressive symptoms and externalizing problems. To date, no studies have thoroughly investigated how the initial level and rate of change interact to shape victimization trajectories, leaving unanswered questions about whether individual differences in initial levels increase or decrease over time, and whether peer victimization influences outcomes through a "risk susceptibility" pattern (where initial level confers vulnerability) or a "risk enhancement" pattern (where initial level and change rate combine to exacerbate outcomes). The present study addresses these gaps by examining peer victimization trajectories from three perspectives: initial level, rate of change, and their interrelationship. This approach not only elucidates the dynamic patterns of peer victimization but also clarifies the mechanisms through which victimization generates and intensifies depressive symptoms and externalizing problems, thereby providing comprehensive and timely support for targeted interventions.

1.1 Trajectories of Peer Victimization

Researchers have increasingly focused on peer victimization trajectories, examining them from various perspectives. Initially, cross-sectional studies adopted a static view to investigate age-related differences in victimization levels (Lian et al., 2018). Subsequently, to capture dynamic trends, researchers used two time points to examine stability in victimization (Pouwels et al., 2016), reflecting individuals' relative standing within the group over time. However, this approach cannot accurately depict the absolute level of victimization as it evolves. Only through long-term longitudinal designs can we capture the intrinsic characteristics of how peer victimization changes over time.

How can longitudinal designs accurately capture these change characteristics? The complete picture of peer victimization trajectories emerges from three components: initial level, rate of change, and their relationship. Longitudinal designs incorporating temporal dimensions can describe three critical features of change. First, the initial level reflects the severity of victimization at the outset. Second, the rate of change captures the increasing or decreasing trend in victimization, indicating whether individuals become more entrenched in or escape from victimization over time. Third, the relationship between initial level and rate of change reveals whether individual differences in initial levels widen or narrow over time (Grimm et al., 2017). Together, these three features integrate the starting point, trend, and interrelationship of victimization changes, addressing key questions about initial severity, change velocity, and the evolution of individual differences. This comprehensive portrait provides practitioners with clues about future victimization states, enabling them to infer whether trends are worsening and whether individuals with disparate initial levels can narrow the gap, thereby informing personalized intervention plans.

Existing longitudinal studies have begun exploring peer victimization trajectories, consistently finding linear decreasing trends (Cho, 2018; Ladd et al., 2017; Rudolph et al., 2011; Sugimura et al., 2017), with negative correlations between initial level and decline rate (Troop-Gordon & Ladd, 2005). However, most prior research has focused solely on initial levels and change rates, inadequately addressing their interrelationship. This limitation prevents clarification of whether individual differences in initial victimization levels remain stable or diminish as emotional regulation skills and coping strategies mature. Therefore, the present study employs a three-wave longitudinal design to characterize victimization trajectories from three perspectives: level, trend, and relationship.

Although depicting overall trajectories helps grasp general patterns among all adolescents, precision intervention advocates for targeted prevention and treatment across subgroups. This raises an important question: Do different subgroups follow identical victimization trajectories? Numerous studies have examined differences in victimization levels across migration status, grade level, and gender (Chen et al., 2019; Huang et al., 2013; Wei et al., 2016), yet few longitudinal studies have investigated whether these groups also differ in victimization change patterns. Building upon overall trajectories, the present study examines micro-level differences across migration status, grade, and gender to determine whether specific adolescent groups deviate from general patterns, providing scientific evidence for identifying and intervening with high-risk youth.

Children of different migration statuses (e.g., left-behind children, rural-to-urban migrant children) face varying victimization risks due to distinct environmental contexts. A review of 31 empirical studies by Chen et al. (2019) found that left-behind children experienced 1.55 times higher victimization rates than rural non-left-behind children, while migrant children experienced 1.23 times higher rates than urban non-migrant children, indicating that victimization levels vary by migration status. Do these differences extend to change rates and the relationship between initial level and change rate? This question remains unanswered in prior research, preventing identification of who constitutes high-risk groups that remain vulnerable over time. The present study includes four child groups—migrant, left-behind, rural, and urban—to examine whether victimization trajectories differ by migration status, thereby elucidating trajectory heterogeneity and laying groundwork for precision intervention.

Grade-level differences also represent a key focus. Social dominance theory suggests that adolescents may use aggression to compete for and maintain social status (Espelage & Holt, 2001). Different grades may prioritize social status within peer groups differently, potentially leading to grade-related victimization differences. Moreover, grades may vary in emotional regulation capacity and problem-solving strategy maturity, resulting in differential victimization experiences (Troop-Gordon, 2017). Cross-sectional research has found higher victimization among elementary than middle school students (Zhang, 2002), and higher rates among middle than high school students (Wei et al., 2016). However, these findings only demonstrate between-person differences at single

time points, failing to capture within-person change trends. The present study incorporates elementary, middle, and high school grades to comprehensively reveal trajectory differences both between and within grades, addressing when initial victimization levels are higher and change rates faster.

Unlike preliminary explorations of grade differences, existing research has examined gender differences in victimization trajectories. Findings indicate that boys show higher initial victimization levels than girls, but similar decline rates (Ladd et al., 2017; Rudolph et al., 2011; Troop-Gordon & Ladd, 2005). However, these studies had relatively small samples, limiting reliability. Second, insufficient investigation of gender differences in the relationship between initial level and change rate leaves unanswered whether initial disparities between boys and girls remain stable over time. Therefore, the present study examines gender differences in initial level, change rate, and their interrelationship within a larger longitudinal sample to determine which gender experiences more persistent victimization risk. Based on prior research, we hypothesize that boys will show higher initial victimization levels than girls but similar decline rates, making no specific prediction about their interrelationship.

1.2 Peer Victimization Trajectories and Their Relationships with Depressive Symptoms and Externalizing Problems: Risk Enhancement or Risk Susceptibility?

The negative consequences of peer victimization have received extensive attention, with depressive symptoms and externalizing problems representing two primary manifestations of maladjustment frequently used as indicators of adolescent maladaptation (Yoon et al., 2017). The interpersonal risk model (Patterson & Capaldi, 1990) posits that peer victimization constitutes a major stressor that triggers negative self-evaluations and internalization, leading to persistent self-blame and rumination that ultimately result in depression. Based on the social information processing model (Dodge & Schwartz, 1997), peer victimization may increase hostile cognitive biases, leading individuals to interpret interpersonal events with hostility and consequently display aggressive behaviors. Moreover, victimized individuals may use aggression to protect themselves or retaliate against others (Reijntjes et al., 2011). Consistent with these theoretical perspectives, peer victimization significantly predicts internalizing and externalizing problems in adulthood (Takizawa et al., 2014). A meta-analysis of 16 quasi-experimental studies also identified peer victimization as a significant predictor of internalizing and externalizing problems (Schoeler et al., 2018). Furthermore, a meta-analysis examining reciprocal relationships found that although bidirectional associations exist between peer victimization and internalizing problems, victimization more strongly predicts internalizing problems (Reijntjes et al., 2010). In summary, multiple theories and empirical studies support the effect of peer victimization on depressive symptoms and externalizing problems.

How do peer victimization trajectories influence subsequent depressive symp-

toms and externalizing problems? Rudolph et al. (2011) conducted a three-wave annual follow-up of 238 second-grade students and found that both initial level and change rate in peer victimization significantly predicted fifth-grade depressive symptoms and aggressive behavior. However, this study only examined the unique effects of initial level and change rate separately, without addressing their synergistic effects. In fact, investigating these synergistic effects is crucial for several reasons. First, theoretically, the same rate of change may have differential impacts on individuals with high versus low initial levels, with high initial-level individuals typically exhibiting more problem behaviors (Lane, 2014). Thus, initial level and change rate do not independently influence development but rather operate synergistically. Methodologists have also noted that focusing solely on main effects may fail to reflect true data patterns and could bias parameter estimation and interpretation (Lane, 2014). Therefore, examining the synergistic effects of initial level and change rate can clarify whether initial level alone is decisive or whether the combination of initial level and change rate plays a more critical role. Second, understanding these synergistic patterns has important practical implications for intervention planning. If initial level exerts a dominant, persistent influence on problem behaviors, then victimization produces long-term effects once it occurs, posing significant challenges for intervention effectiveness and necessitating prevention at the outset. If both initial level and change rate jointly influence outcomes, then interventions targeting change rate after victimization occurs can still reduce risks for internalizing and externalizing problems and prevent risk escalation (El-Sheikh et al., 2019; Lane, 2014). Although no empirical studies have examined the synergistic effects of initial level and change rate in peer victimization, several cutting-edge studies have tested these interactions in other domains (e.g., marital conflict) and revealed how initial level and change rate influence developmental outcomes (Chahal et al., 2020; El-Sheikh et al., 2019; Johnson et al., 2021). The present study extends this approach to peer victimization for the first time, addressing whether initial level alone or the combination of initial level and change rate determines effects on depressive symptoms and externalizing problems.

Two competing models can explain the relationship between initial level and change rate: additive effects and interactive effects. The additive effects model (see Figure 1a [Figure 1: see original paper]) posits that prior major stress (high initial level) and subsequent stress (slow decline rate; since peer victimization shows an overall decreasing trend, slower decline represents greater risk) accumulate to deplete psychosocial, physiological, and cognitive functioning, thereby increasing problem behavior risk (Myers et al., 2015). This model assumes no interaction between initial level and change rate, with each risk factor operating independently. In contrast, the interactive effects model proposes that the impact of change rate on problem behaviors depends on initial level. Multiple reviews in leading journals have suggested complex interactions between prior and subsequent stress, potentially operating through different patterns such as the stress amplification model and stress sensitization model (Rudolph et al., 2016; Zahn-Waxler et al., 2008).

The stress amplification model (see Figure 1b) emphasizes that high initial levels amplify the detrimental effects of slow decline rates. When decline rates slow (i.e., individuals remain at high victimization risk), high initial-level individuals exhibit more problem behaviors than low initial-level individuals. This model suggests that prior major stress damages existing coping and emotion regulation capacities, preventing individuals from effectively managing subsequent stress and increasing vulnerability to problem behaviors. Thus, when high initial-level individuals experience slow decline rates, their previously impaired coping abilities cannot address ongoing victimization risk (Rudolph et al., 2016), rendering them more vulnerable and increasing problem behavior risk through risk escalation (Edmond et al., 2014). Conversely, when low initial-level individuals experience slow decline rates, their emotion regulation and stress response systems remain only minimally impaired, allowing them to utilize existing resources to manage victimization risk, resulting in fewer problem behaviors.

The stress sensitization model (see Figure 1c) proposes that prior major stress disrupts neuro-physiological-psychological system regulation and alters stress susceptibility, sensitizing the stress response system and increasing accessibility of negative information processing modes. This causes individuals to more easily activate negative processing patterns even when facing minor stress, ultimately increasing problem behavior risk (Harkness et al., 2006; Heim & Nemeroff, 2001). Therefore, although rapid decline rates indicate lower victimization risk, high initial-level individuals' neurophysiological stress systems have been altered and sensitized, leading them to exhibit higher problem behaviors even with rapid decline rates (Rudolph & Flynn, 2007). Consequently, high initial-level individuals show relatively high problem behaviors regardless of decline speed, resulting in smaller increases, whereas low initial-level individuals' stress systems remain unsensitized, only showing elevated problem behaviors when decline rates are slow, resulting in larger increases.

In summary, to comprehensively capture peer victimization dynamics, the present study used four waves of measurement to examine victimization trajectories from Time 1 to Time 3 and their group heterogeneity. Building on this foundation, we further investigated how these trajectories relate to depressive symptoms and externalizing problems at Time 4, specifically addressing whether initial level and change rate operate independently (additive effects) or synergistically (stress amplification or stress sensitization). This approach reveals how initial level and change rate uniquely influence depressive symptoms and externalizing problems, providing important insights for effectively assisting victimized adolescents and reducing problem behaviors.

Note: Since peer victimization shows an overall decreasing trend with negative change rates, slower decline indicates smaller reductions in victimization levels over time, while faster decline indicates larger reductions.

[Figure 1: see original paper] Conceptual framework of how initial level and change rate of peer victimization predict problem behaviors

2.1 Participants

Data were drawn from a large-scale longitudinal project examining positive youth development among migrant children. This two-year study comprised four waves of assessment. At baseline, a three-stage stratified cluster sampling method was used to select three provinces with high proportions of migrant and left-behind children. Within each province, districts/counties were selected based on educational and economic development indices and urban-rural student ratios. Schools were then selected according to migrant or left-behind child proportions, with natural classes sampled from each school. Each class contained different child types, and surveys were administered at the class level, yielding a representative sample. Because some students missed the fourth wave due to graduation or school transitions, preventing examination of how victimization trajectories predicted Time 4 outcomes, the present study focused on 1,580 students (867 boys) who completed all four waves. At baseline, participants' mean age was 12.37 years (SD = 2.52, range = 9–19). The sample included 682 elementary school students (43.16%), 523 middle school students (33.10%), and 375 high school students (23.73%). Migrant children, left-behind children, rural children, and urban children comprised 402 (25.44%), 258 (16.33%), 205 (12.97%), and 695 (43.99%) participants, respectively, with 20 (1.27%) having unclear status (see Appendix S1 for demographic information on the four child groups). Regarding parental education, 51.58% of fathers and 54.81% of mothers had junior high school education or below, 26.20% and 24.24% had technical secondary school or high school education, 19.94% and 19.05% had college education or above, and 2.28% and 1.90% did not report education levels.

2.2.1 Peer Victimization

The Multidimensional Peer Victimization Scale (MPVS), adapted by Ye et al. (2016), was administered at Waves 1–3 to assess victimization by school peers. Guo et al. (2017) previously confirmed the scale's structural validity among Chinese children and adolescents using confirmatory factor analysis. The 18-item scale comprises four dimensions: physical victimization (3 items, e.g., "Some classmates threatened to hit me"), verbal victimization (5 items, e.g., "Some classmates deliberately cursed at me or used obscene language"), relational victimization (7 items, e.g., "Some classmates turned others against me"), and property victimization (3 items, e.g., "Some classmates stole my belongings"). Items were rated on a 4-point scale (1 = never happened, 4 = happened frequently), with mean scores calculated across all items. Higher scores indicated more frequent victimization. Internal consistency coefficients were 0.96, 0.95, and 0.96 across the three waves.

2.2.2 Depressive Symptoms

The short version of the Center for Epidemiological Studies Depression Scale (CES-DS; Radloff, 1977) was administered at Waves 1 and 4 to assess depressive symptoms during the past week. Widely used in general population surveys

(Hou & Chen, 2016), the scale includes 13 symptom descriptions such as "I felt sad." Items were rated on a 4-point scale (1 = never, 4 = always), with mean scores serving as the depressive symptoms index. Higher scores indicated more severe depressive symptoms. Internal consistency coefficients were 0.87 and 0.89 at Waves 1 and 4, respectively.

2.2.3 Externalizing Problems

The externalizing problems subscale from the Child Behavior Checklist (CBCL; Achenbach & Rescorla, 2001), revised by Li et al. (2009), was used at Waves 1 and 4 to assess aggressive, hostile, and oppositional behaviors. The scale includes 16 descriptions of externalizing behaviors such as "likes to argue." Items were rated on a 4-point scale (1 = never, 4 = always), with mean scores representing externalizing problem severity. Higher scores indicated more severe externalizing problems. The scale has demonstrated strong reliability and validity in international child and adolescent samples (Li et al., 2009; Rescorla et al., 2007). Internal consistency coefficients were 0.89 and 0.91 at Waves 1 and 4, respectively.

2.3 Procedure

After obtaining informed consent from schools and students, the first wave of group assessment was conducted in fall 2017 (T1). Three subsequent follow-up assessments were administered in fall 2018 (T2), spring 2019 (T3), and fall 2019 (T4). Content and procedures were consistent across all four waves. Although we attempted to ensure equal measurement intervals, practical challenges in tracking participants across regions and schools resulted in partially unequal intervals. Before each assessment, administrators received standardized professional training. Two administrators facilitated group testing per class, explaining survey purposes, instructions, confidentiality, and voluntary participation; monitoring responses; answering questions; and checking questionnaire quality after completion. Students required approximately 45 minutes to complete all measures.

2.4 Common Method Bias and Assessment

Self-report methods reliably capture children' s authentic experiences and feelings, but single-source reporting may introduce common method bias. Following researchers' recommendations and prior practices, we employed several procedural remedies to minimize bias, including counterbalancing questionnaire order and using reverse-scored items (Zhou & Long, 2004). Before primary analyses, Harman' s single-factor test was conducted via factor analysis, revealing that the first common factor explained 23.39% of variance, well below the 40.00% critical threshold. This suggests that common method bias was not a serious concern in this study.

2.5 Analytic Strategy

SPSS 23.0 and Mplus 8.0 were used for preliminary and primary analyses, respectively. First, Pearson correlations examined relationships among study variables. Second, measurement invariance tests ensured that the peer victimization latent factor had equivalent meaning across time, gender, migration status, and grade level (Chen, 2007). Finally, analyses proceeded in three steps using latent growth curve modeling (Grimm et al., 2017). Step 1 employed an unconditional latent growth curve model to characterize overall victimization trajectories, extracting initial level and change rate from three time points. Following model requirements (Grimm et al., 2017), residual variances for victimization across time points were constrained equal. Factor loadings were fixed at 1 to estimate initial level and at 0, 2, and 3 to estimate change rate across the three unequally spaced time points (Preacher et al., 2008). The correlation between initial level and change rate was also estimated. Step 2 used multi-group latent growth curve models to test whether victimization trajectories differed by migration status. Four nested models tested group differences in initial level, change rate, and their interrelationship: Model 1 (M1) was unconstrained, while Models 2 (M2), 3 (M3), and 4 (M4) constrained initial level, change rate, and their correlation to equality across groups, respectively. Significant deterioration in model fit relative to the unconstrained model indicated significant trajectory differences. Step 3 built two conditional latent growth curve models incorporating depressive symptoms and externalizing problems to examine whether initial level, change rate, and their interaction from T1–T3 predicted T4 outcomes after controlling for gender, grade, migration status, subjective socioeconomic status, and baseline problem behaviors (El-Sheikh et al., 2019; Johnson et al., 2021; Lane, 2014; Maslowsky et al., 2015). Full information maximum likelihood (FIML) estimation handled missing data to minimize bias in regression coefficient and standard error estimates (Schlomer et al., 2010). Model fit was evaluated using CFI, TLI, RMSEA, and SRMR, with CFI and TLI ≥ 0.95, RMSEA ≤ 0.08, and SRMR ≤ 0.06 indicating good fit (Hu & Bentler, 1999).

3.1 Correlational Analysis of Peer Victimization with Depressive Symptoms and Externalizing Problems

Demographic differences in peer victimization are detailed in Appendix Table S2. Table 1 presents means, standard deviations, and correlations for all variables. Results showed moderate correlations among victimization measures across the three waves (rs = 0.42–0.55, ps < 0.001), indicating moderate stability. Victimization at all three waves was significantly positively correlated with depressive symptoms (rs = 0.23–0.49, ps < 0.001) and externalizing problems (rs = 0.24–0.41, ps < 0.001) at both time points, demonstrating that higher victimization was associated with higher levels of both outcomes.

3.2 Measurement Invariance Testing

Following methodological recommendations (Chen, 2007), changes in CFI and RMSEA below 0.010 and 0.015, respectively, support more parsimonious models. We compared four nested models: configural invariance (equal factor structure), weak invariance (equal factor loadings), strong invariance (equal factor loadings and intercepts), and strict invariance (equal factor loadings, intercepts, and residual variances). As shown in Table 2 , strong invariance was supported for peer victimization across grade, migration status, gender, and time, permitting multi-group analyses of structural parameters.

3.3 Peer Victimization Trajectories

The unconditional latent growth model fit the data well: CFI = 0.99, TLI = 0.99, RMSEA = 0.05, SRMR = 0.02. Results revealed significant initial level (b = 1.58, $p < 0.001$) and change rate (b = -0.03, $p < 0.001$), indicating an overall linear decreasing trend. The initial level and change rate were significantly negatively correlated (b = -0.03, $p < 0.001$), showing that individuals with higher initial victimization levels declined more rapidly. Significant variances in both initial level (b = 0.26, $p < 0.001$) and change rate (b = 0.02, $p < 0.001$) indicated substantial individual differences in starting points and decline rates.

3.3.1 Migration Status Differences in Victimization Trajectories Using urban children as the reference group, multi-group analyses tested whether other groups differed significantly. Results (see Appendix Table S3) showed: (1) Migrant children [initial level: Δ 2(1) = 5.49, p = 0.019; change rate: Δ 2(1) = 5.81, p = 0.016] and left-behind children [initial level: Δ 2(1) = 29.99, $p < 0.001$; change rate: Δ 2(1) = 4.68, p = 0.031] differed significantly from urban children in both initial level and change rate. Only migrant children differed significantly from urban children in the correlation between initial level and change rate [Δ 2(1) = 4.18, p = 0.041], while left-behind children did not [Δ 2(1) = 0.64, p = 0.425]. As shown in Figure 2a [Figure 2: see original paper], migrant children (b = 1.59, $p < 0.001$) and left-behind children (b = 1.75, $p < 0.001$) had higher initial victimization levels than urban children (b = 1.50, $p < 0.001$). Regarding decline rates, urban children' s victimization showed a non-significant decreasing trend (b = -0.01, p = 0.152), whereas migrant children (b = -0.05, $p < 0.001$) and left-behind children (b = -0.05, p = 0.001) showed significant decreasing trajectories that were significantly steeper than urban children' s. For the correlation between initial level and change rate, migrant children with high initial levels (b = -0.05, $p < 0.001$) declined faster than urban children (b = -0.02, p = 0.007). (2) Rural children differed from urban children only in initial level [Δ 2(1) = 5.56, p = 0.018], not in change rate [Δ 2(1) = 2.24, p = 0.134] or their correlation [Δ 2(1) = 0.02, p = 0.892]. As shown in Figure 2a, rural children (b = 1.61, $p < 0.001$) had higher initial victimization than urban children, but similar decline rates (rural children slope: b = -0.04, p = 0.010). This indicates that rural children experienced more severe victimization at the

outset, but their rate of decline was comparable to urban children' s.

3.3.2 Supplementary Analyses: Grade and Gender Differences in Victimization Trajectories Given prior research demonstrating grade and gender differences in victimization levels (Huang et al., 2013; Wei et al., 2016), supplementary analyses examined whether trajectories differed across gender and grade. First, multi-group analyses using nested models tested whether initial level, change rate, and their correlation differed by gender. As shown in Appendix Table S3, chi-square difference tests revealed significant gender differences in initial level [Δ 2(1) = 52.15, p < 0.001] and the correlation between initial level and change rate [Δ 2(1) = 7.73, p = 0.005], but not in change rate [Δ 2(1) = 3.09, p = 0.079]. Boys (b = 1.69, p < 0.001) had higher initial victimization than girls (b = 1.46, p < 0.001), and boys with high initial levels (b = -0.04, p < 0.001) declined faster than girls (b = -0.01, p = 0.013), though both showed decreasing trends (boys: b = -0.04, p < 0.001; girls: b = -0.02, p = 0.004; see Figure 2b [Figure 2: see original paper]).

Second, multi-group analyses tested grade differences in victimization trajectories. Using high school students as the reference group, we compared elementary and middle school students separately. Chi-square difference tests (see Appendix Table S3) showed: (1) Elementary students differed from high school students in initial level [Δ 2(1) = 14.86, p < 0.001] but not in change rate [Δ 2(1) = 0.11, p = 0.737] or their correlation [Δ 2(1) = 3.58, p = 0.059]. (2) Middle school students differed from high school students in both initial level [Δ 2(1) = 15.15, p < 0.001] and change rate [Δ 2(1) = 8.20, p = 0.004], but not in their correlation (Δ 2(1) = 1.02, p = 0.314). As shown in Figure 2c [Figure 2: see original paper], high school students (b = 1.47, p < 0.001) had significantly lower initial victimization than middle school (b = 1.62, p < 0.001) and elementary school students (b = 1.62, p < 0.001). Although high school students showed a slight decreasing trend, it was non-significant (b = -0.02, p = 0.117), whereas middle school (b = -0.06, p < 0.001) and elementary school students (b = -0.02, p = 0.029) showed significant decreasing trajectories. However, high school students' decline rate was significantly slower only compared to middle school students, not elementary school students. Finally, to determine whether middle school victimization remained consistently lower than elementary school, we directly compared these groups. Chi-square difference tests (see Appendix Table S3) showed no significant differences in initial level [Δ 2(1) = 0.04, p = 0.836] or the correlation between initial level and change rate [Δ 2(1) = 0.61, p = 0.435], with only change rate showing a significant difference [Δ 2(1) = 6.91, p = 0.009]. As shown in Figure 2c, middle school students (b = -0.06, p < 0.001) declined faster than elementary school students (b = -0.02, p = 0.029). This supports the overall pattern that elementary school students had higher victimization levels than middle school students (Zhang, 2002), possibly because middle school students gradually learn to cope with victimization as they mature.

3.4.1 Victimization Trajectories and Depressive Symptoms

To examine relationships between victimization trajectories and Time 4 depressive symptoms, a conditional latent growth curve model (see Figure 3 [Figure 3: see original paper]) included T4 depressive symptoms as an outcome, with initial level, change rate, and their interaction from T1–T3 as predictors. The model controlled for gender (0 = male, 1 = female), grade, migration status (urban children as reference), subjective socioeconomic status, and baseline depressive symptoms. First, initial level and change rate simultaneously predicted T4 depressive symptoms. The model fit well (CFI = 1.00, TLI = 0.99, RMSEA = 0.02, SRMR = 0.01). After controlling for covariates and baseline depressive symptoms, both initial level (b = 0.38, $p < 0.001$) and change rate (b = 0.43, $p < 0.001$) significantly positively predicted T4 depressive symptoms. Next, the interaction term was added, revealing a significant interaction between initial level and change rate (b = -0.11, p = 0.025). Following Aiken and West (1991), we examined the relationship between change rate and T4 depressive symptoms at high and low initial levels ($±$1 SD). Simple slope analyses (see Figure 4 [Figure 4: see original paper]) showed a moderate correlation between change rate and depressive symptoms among high initial-level individuals (b = 0.31, $p < 0.001$), indicating that even with rapid decline, high initial-level individuals reported more depressive symptoms, with symptoms increasing slowly as decline rate slowed. In contrast, low initial-level individuals showed a strong correlation (b = 0.68, $p < 0.001$), indicating that with rapid decline they reported low depressive symptoms, but symptoms increased substantially as decline rate slowed. In other words, low initial-level individuals only showed high depressive symptoms when decline rates were slow. These results support the stress sensitization model: prior victimization stress (high initial level) sensitizes individuals to subsequent moderate or minor stressors, resulting in more depressive symptoms.

3.4.2 Victimization Trajectories and Externalizing Problems

Parallel analyses examined externalizing problems. First, initial level and change rate simultaneously predicted T4 externalizing problems. Because T1 and T4 externalizing problems showed absolute skewness values > 1 (Tabachnick & Fidell, 2018), violating normality assumptions for regression, logarithmic transformation was applied to reduce skewness (Feng et al., 2014). The model fit well (CFI = 0.99, TLI = 0.98, RMSEA = 0.03, SRMR = 0.01). After controlling for covariates and baseline externalizing problems, both initial level (b = 0.41, $p < 0.001$) and change rate (b = 0.45, $p < 0.001$) significantly positively predicted T4 externalizing problems. Adding the interaction term revealed a significant interaction (b = 0.04, $p < 0.001$). Following Aiken and West (1991), simple slope analyses (see Figure 6 [Figure 6: see original paper]) showed a weaker relationship between change rate and externalizing problems among low initial-level individuals (b = 0.06, $p < 0.001$), indicating small increases in externalizing problems as decline rate slowed. In contrast, the

relationship was stronger among high initial-level individuals (b = 0.10, p < 0.001), indicating larger increases in externalizing problems as decline rate slowed. These results fully support the stress amplification model.

[Figure 5: see original paper] Conditional latent growth curve model of victimization trajectories predicting externalizing problems

[Figure 6: see original paper] Interaction between initial level and change rate of peer victimization on T4 externalizing problems
Note: This figure was plotted based on model parameter estimates, with externalizing problems for individuals low on both initial level and change rate fitted below zero. Since the externalizing problems scale has no negative values, negative values were corrected to the minimum score (i.e., 0), following previous literature (El-Sheikh et al., 2019).

3.5 Supplementary Analyses: Group Differences in Relationships Between Victimization Trajectories and Outcomes

Theoretically, relationships between victimization trajectories and depressive symptoms/externalizing problems may vary by grade and migration status (Jiang & Liang, 2021; Yan et al., 2022). Multi-group comparison models tested whether paths from initial level, change rate, and their interaction to outcomes differed between elementary/middle school students and high school students. Results showed that only the path from change rate to externalizing problems was stronger among middle school students (Δ 2(1) = 4.67, p = 0.031); all other path coefficients were non-significant (ps > 0.05). Similarly, multi-group models compared migrant, left-behind, and rural children to urban children. Only the relationship between initial level and externalizing problems was stronger among migrant children (Δ 2(1) = 3.93, p = 0.047); all other paths were non-significant (ps > 0.05). Overall, relationships between victimization trajectories and outcomes held across grade and migration groups. Therefore, final results are reported for the full sample.

Adolescence represents a critical period for the onset of depressive symptoms and externalizing problems, with peer victimization serving as a key risk factor (Espelage & Holt, 2001). Adolescents may be particularly sensitive to peer pressure (Sisk & Gee, 2022), making victimization experiences during this period especially detrimental (Duarte et al., 2017). Thus, adolescence is an important developmental window for examining victimization trajectories and their relationships with adjustment outcomes, helping identify optimal timing for prevention and intervention to block adverse effects.

Analyzing three waves of data, we found that peer victimization followed a linear decreasing trend that varied by migration status, gender, and grade. We further examined how initial level and change rate jointly influenced depressive symptoms and externalizing problems two years later. After controlling for demographics and baseline problems, initial level and change rate affected depressive symptoms through stress sensitization and externalizing problems

through stress amplification.

4.1 Peer Victimization Trajectories

The linear decreasing trend in peer victimization aligns with existing longitudinal findings (Cho, 2018; Ladd et al., 2017; Sugimura et al., 2017). For example, Ladd et al. (2017) tracked 383 children from kindergarten through 12th grade and also found decreasing victimization over time. This pattern likely reflects three factors: First, problem-solving and emotion regulation skills improve with age, providing effective strategies for handling peer conflicts without resorting to aggression (Rudolph et al., 2011). Second, Chinese culture influences adolescents'aggressive behaviors and attitudes through socialization processes (Chen & French, 2008). In collectivist cultures emphasizing group harmony, children are taught that aggression violates social norms. As socialization deepens, children' s behavioral norms and attitudes toward aggression increasingly align with societal expectations, reducing aggressive behaviors and negative attitudes (Chen & French, 2008). Third, the significant negative correlation between initial level and decline rate indicates that initial-level differences diminished over time, suggesting that higher initial levels created more room for decline. However, this decreasing trend should not be viewed with simple optimism; the corresponding initial levels warrant careful attention.

4.1.1 Group Differences in Victimization Trajectories We found that migrant, left-behind, and rural children all had higher initial victimization levels than urban children. This may stem from adverse factors such as high mobility, weak family bonds, and inadequate parental supervision, which compromise social skills and peer status, making these children easy targets (Chen et al., 2019). Additionally, migrant and left-behind children declined faster than urban children, likely due to both individual and environmental factors. On one hand, as adolescents develop social skills over time, those starting higher (migrant and left-behind children) have more room to decline, whereas urban children starting lower have limited decline potential. On the other hand, schools and teachers may pay special attention to disadvantaged migrant and left-behind children (Zhang et al., 2015), enabling rapid identification and intervention for high-risk students, effectively reducing future victimization. These results highlight the central role of initial level in shaping change trajectories, suggesting that preventing victimization at the outset yields maximal intervention benefits.

Consistent with prior research (Ladd et al., 2017), boys showed higher initial victimization than girls with similar decline rates. Extending previous work, we found that the correlation between initial level and change rate differed by gender: boys with high initial levels declined faster than girls. This indicates that boys' faster decline stems from their higher initial levels and greater decline potential. These findings underscore the importance of a holistic perspective—one should not overlook boys' prior victimization simply because they decline faster. Additionally, high school students had significantly lower victimization

than middle and elementary school students, but their decline rate was slower than middle school students' and similar to elementary students' . These results suggest that victimization decreases across all grades, but middle and elementary students' developing cognitive control functions make it difficult to regulate emotions and behaviors. Their immature emotion regulation and coping strategies render them more vulnerable to peer victimization (Troop-Gordon, 2017). Although high school students showed lower victimization levels, the increasing prevalence of online victimization among this age group warrants future investigation of both traditional and cyber victimization to reveal grade-related differences across victimization forms (Díaz et al., 2021). Furthermore, middle school students declined faster than elementary students, supporting the overall pattern that elementary students have higher victimization levels (Zhang, 2002). This may reflect middle school students' growing capacity to cope with victimization as they mature. However, because middle school represents a critical developmental period with potentially different victimization forms, future research should more thoroughly examine differences in victimization forms between middle and elementary school students.

In summary, this study documented group differences in initial level and change rate among migrant and left-behind children and middle school students, but not among rural children, elementary students, or across genders. However, theoretical considerations suggest that migration status, grade, and gender may produce distinct trajectory patterns due to differences in environmental contexts, developmental stages, and physiological characteristics (Chen et al., 2019; Huang et al., 2013; Wen et al., 2016). Therefore, the present study may have been limited by sample size and measurement occasions in fully capturing group differences, highlighting the need for larger, more diverse samples and longer-term longitudinal designs in future research.

4.2 Victimization Trajectories and Adjustment Outcomes

Examining lagged effects of victimization trajectories (Waves 1–3) on Wave 4 outcomes, we found significant interactions between initial level and change rate that operated through stress sensitization for depressive symptoms and stress amplification for externalizing problems, rather than simple additive effects.

For depressive symptoms, high initial levels altered sensitivity to change rate, lowering the threshold for triggering depressive symptoms such that even rapid decline could elicit symptoms. In contrast, low initial-level individuals showed low depressive symptoms with rapid decline, requiring slower decline to trigger symptoms. This pattern supports the stress sensitization model and demonstrates that the key difference between groups lies in whether initial victimization was frequent—an early misstep that can compromise mental health. Integrating Beck's cognitive theory (Beck, 1976) and the hopelessness model (Abramson et al., 1989), the cognitive vulnerability-stress model proposes that stressful events produce cognitive distortions, attributing events to internal and stable causes, generating self-blame and rumination, and fostering negative views of

self, others, and world, thereby increasing depression risk. Conversely, high depressive symptoms alter attentional biases, causing minor stressors to activate depressive processes, creating a vicious cycle that reinforces and exacerbates symptoms (Pössel & Smith, 2020). According to this perspective, high initial-level victimization increases interpersonal helplessness and undermines coping efficacy, leading victims to attribute victimization to themselves and become trapped in self-blame and rumination (Juvonen & Graham, 2014), increasing depression risk. Although victimization declines over time, high initial-level individuals with depressive symptoms tend to attend to and process negative stimuli while avoiding positive ones (Schweizer & Hankin, 2020), and view peer relationships negatively—perceiving unkindness or victimization even when victimization levels are low. This automatic negative processing perpetuates self-blame, rumination, and hopelessness, triggering recurrent depressive symptoms. Recent research indicates that first-onset depression requires severe stress, but subsequent episodes become more automatic, requiring only minor stressors (Monroe et al., 2019). These results emphasize the vulnerability of individuals who experienced high initial stress, showing disadvantageous sensitivity even in low-risk environments with rapid decline. Intervention practitioners should pay close attention to initial victimization levels and prioritize mental health monitoring for children and adolescents with severe early victimization, implementing effective measures during critical periods to reduce stress reactivity and prevent depressive problems.

For externalizing problems, individuals with high initial levels who also experienced slow decline reported the most externalizing problems, indicating that high initial levels amplified the effect of slow decline beyond simple additive effects—validating the stress amplification model. This pattern can be explained by the social information processing model (Dodge & Schwartz, 1997), which posits that individuals encode and interpret social stimuli based on prior experiences, beliefs, and contexts, influencing reactions and subsequent behavioral outcomes. According to this perspective, individuals with frequent early victimization become sensitized to negative peer interactions based on their prior experiences, rapidly identifying hostile intent in others' behaviors. This hostile attribution bias amplifies perceived hostility (Schacter & Juvonen, 2015), leading individuals to believe peers deliberately target or bully them (Díaz et al., 2021), prompting aggressive responses to conflict or self-protection (Epkins, 2000). Conversely, low initial-level individuals, lacking victimization history, are relatively insensitive to hostile intent and thus less likely to respond aggressively. Therefore, when victimization decline slows, high initial-level individuals' prior experiences enable rapid identification of hostile intent, triggering intense anger and more aggressive responses, whereas low initial-level individuals perceive less hostility and exhibit fewer externalizing behaviors. In essence, high initial levels amplify hostile processing of negative peer interactions, intensifying perceived hostility and causing externalizing problems to accumulate rapidly as decline slows. These results emphasize that high initial level serves as a trigger for externalizing problems, while slow decline acts as a catalyst, with their

combination creating a snowball effect.

Although we found no grade or migration status differences in relationships between victimization trajectories and outcomes, theoretical considerations suggest such differences may exist. For example, when experiencing victimization, left-behind and migrant children may exhibit more depressive symptoms and externalizing problems than other children due to prolonged parent-child separation and parental mobility, which limit timely support and protection needed to effectively cope with victimization and its consequences (Jiang & Liang, 2021; Yan et al., 2022). However, research findings are mixed: some studies find group differences (Jiang & Liang, 2021), while others do not (Zhang et al., 2021). Given these inconsistencies, future research should use larger samples, longer-term longitudinal designs, and more advanced analytic methods to deepen understanding of potential group differences.

4.3 Contributions, Limitations, and Future Directions

This study makes several contributions. First, it holistically depicts the universality and specificity of Chinese adolescents' peer victimization trajectories from three perspectives—initial level, change rate, and their interrelationship—revealing general patterns of victimization change. Identifying group heterogeneity in trajectories provides a basis for precise detection and targeted intervention for high-risk groups. Second, this study is the first to clarify how initial level and change rate synergistically influence depressive symptoms and externalizing problems, providing nuanced insights beyond simple main effects and highlighting that synergistic effects operate in ways that differ from independent contributions. Third, we revealed unique roles of initial level and change rate: frequent early victimization creates "risk susceptibility" for depressive symptoms (Rudolph & Flynn, 2007) and "risk enhancement" for externalizing problems. These differential effects underscore the importance of examining synergistic influences and caution against simplistic, optimistic interpretations of victimization decline without attending to initial levels.

Several limitations warrant mention. First, although peer victimization typically shows linear decreasing trends over longer periods, our relatively short follow-up duration and unequal measurement intervals may not represent long-term patterns. Future research should employ longer, more frequent, and equally spaced assessments to capture potential curvilinear trajectories. Second, methodological requirements led us to include only participants with complete data. Although attrition analyses revealed no significant differences between completers and dropouts on core variables (ps > 0.05), age and migration status differed significantly (ps < 0.05). Therefore, generalization to other age and migration groups requires caution. Third, although we examined lagged effects of victimization change on outcomes, we did not investigate dynamic relationships between changes in victimization and changes in outcomes. Future research should examine how changes in victimization relate to changes in depressive symptoms and externalizing problems, and whether these dynamic relation-

ships differ across internalizing and externalizing domains. Finally, although our questionnaire-based longitudinal data provide statistical insights, they may lack richness for understanding underlying mechanisms. Future research should integrate qualitative methods (e.g., mixed-methods designs) to comprehensively and deeply reveal reasons for victimization changes and mechanisms linking victimization to depressive symptoms and externalizing problems, providing a solid foundation for precision intervention.

Conclusions

1. Peer victimization follows a linear decreasing trajectory that differs by migration status: migrant, left-behind, and rural children show higher initial victimization than urban children, with migrant and left-behind children declining faster.
2. The initial level and change rate in peer victimization influence depressive symptoms and externalizing problems two years later through stress sensitization and stress amplification patterns, respectively.

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Appendix

Table S1 Demographic Information for Four Migration Status Groups

Demographic Characteristics	Migrant Children (n = 402)	Left-behind Children (n = 258)	Rural Children (n = 205)	Urban Children (n = 695)
Age (M ± SD)	12.20 ± 2.31	13.78 ± 2.57	14.00 ± 2.30	11.49 ± 2.23
Parental Marital Status	218 (54.23%)	158 (61.24%)	116 (56.59%)	364 (52.37%)
Parental Education (High School+)	368 (91.54%)	217 (84.11%)	193 (94.15%)	620 (89.21%)
Subjective SES (Middle+)	257 (63.93%)	144 (35.82%)	150 (73.17%)	493 (70.94%)

Table S2 Descriptive Statistics for Peer Victimization at Each Time Point

Group	T1 Victimization	T2 Victimization	T3 Victimization
Overall	1.58 (0.67)	1.53 (0.62)	1.48 (0.62)
Boys	1.69 (0.73)	1.63 (0.68)	1.61 (0.66)

Group	T1 Victimization	T2 Victimization	T3 Victimization
Girls	1.45 (0.56)	1.46 (0.56)	1.43 (0.56)
Elementary	1.60 (0.70)	1.60 (0.72)	1.56 (0.67)
Middle School	1.75 (0.66)	1.61 (0.61)	1.49 (0.59)
High School	1.49 (0.64)	1.48 (0.60)	1.47 (0.63)
Migrant Children	1.61 (0.66)	1.53 (0.55)	1.49 (0.59)
Left-behind Children	1.64 (0.59)	1.56 (0.67)	1.53 (0.64)
Rural Children	1.61 (0.64)	1.49 (0.59)	1.44 (0.64)
Urban Children	1.56 (0.67)	1.53 (0.64)	1.47 (0.63)

Table S3 Group Differences in Peer Victimization Trajectories

Comparison	Model Comparison	Δ^2	p
Migration Status (Urban Reference)			
Migrant vs. Urban	M2-M1 (Intercept)	5.49	0.019
	M3-M2 (Slope)	5.81	0.016
	M4-M1 (Intercept-Slope Correlation)	4.18	0.041
Left-behind vs. Urban	M2-M1 (Intercept)	29.99	< 0.001
	M3-M2 (Slope)	4.68	0.031
	M4-M1 (Intercept-Slope Correlation)	0.64	0.425
Rural vs. Urban	M2-M1 (Intercept)	5.56	0.018
	M3-M2 (Slope)	2.24	0.134
	M4-M1 (Intercept-Slope Correlation)	0.02	0.892
Gender (Male Reference)			
Female vs. Male	M2-M1 (Intercept)	52.15	< 0.001
	M3-M2 (Slope)	3.09	0.079
	M4-M1 (Intercept-Slope Correlation)	7.73	0.005
Grade (High School Reference)			
Elementary vs. High School	M2-M1 (Intercept)	14.86	< 0.001
	M3-M2 (Slope)	0.11	0.737
	M4-M1 (Intercept-Slope Correlation)	3.58	0.059
Middle School vs. High School	M2-M1 (Intercept)	15.15	< 0.001
	M3-M2 (Slope)	8.20	0.004
	M4-M1 (Intercept-Slope Correlation)	1.02	0.314
Middle School vs. Elementary	M2-M1 (Intercept)	0.04	0.836
	M3-M2 (Slope)	6.91	0.009
	M4-M1 (Intercept-Slope Correlation)	0.61	0.435

Preliminary Analysis: Demographic Differences in Peer Victimization

Repeated measures ANOVA on T1–T3 victimization scores revealed a significant time effect, $F(2, 1578) = 15.61$, $p < 0.001$, indicating continuous decline.

Multivariate repeated measures ANOVA with gender, grade, and migration status as independent variables showed significant main effects for gender (Wilks' $\lambda = 0.98$, $F(3, 1532) = 10.93$, $p < 0.001$), grade (Wilks' $\lambda = 0.97$, $F(6, 3064) = 7.43$, $p < 0.001$), and migration status (Wilks' $\lambda = 0.97$, $F(9, 3729) = 5.74$, $p < 0.001$). Post-hoc tests indicated that boys had significantly higher victimization than girls at all three waves. Grade differences showed that high school students had significantly lower victimization than elementary students at all time points ($ps < 0.05$), while middle school students only exceeded high school students at T1 ($p < 0.001$). Migration status differences revealed that left-behind children had significantly higher victimization than migrant, rural, and urban children at all three waves ($ps < 0.05$).

Note: Figure translations are in progress. See original paper for figures.