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EMPIRICAL RESEARCH

Suicide Risk among Chinese Left-Behind Adolescents: Developmental Trajectories and Multi-Contextual Predictors

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Abstract

Suicide is prevalent among left-behind youth, a group that has yet to be thoroughly explored in terms of the developmental dynamics of their suicide risk and associated factors. This study adopted a person-centered approach to investigate the developmental trajectories of suicide risk among Chinese left-behind adolescents, along with multi-dimensional predictors. A total of 774 left-behind adolescents ($M_{age} = 13.60$, 50.1% female) completed three surveys over a year, with six-month intervals. Result of Latent Class Growth Modeling identified three subgroups with distinct developmental trajectories: *High Risk-Escalating* (7.6% of participants started at the highest levels with a worsening trend), *Risk-Holding* (21.6% maintained a stable but risk level starting above the critical threshold), and *Low Risk-Diminishing* (70.8% started low and continued to decrease). Gender (being a female), increased levels of childhood maltreatment, psychological pain, and depression were risk factors for *High Risk-Escalating* and/or *Risk-Holding* trajectories, while increased sense of control and regulatory emotional self-efficacy played protective roles. The findings underscore the malignant developmental patterns of suicide risk among left-behind adolescents. The predictive factors play a crucial role in distinguishing and improving these developmental trajectories.

Keywords Suicide risk · Developmental trajectories · Predictors · Left-behind adolescents

Introduction

Adolescence is a critical period for the onset of suicidality (Nock et al., 2013). In China, suicide is the third leading cause of death among youth aged 10–19 (Zhu et al., 2023). Notably, left-behind adolescents are at a higher risk, being 70% more likely to commit suicidal behavior than their non-left-behind counterparts (Fellmeth et al., 2018), and the risk becomes more pronounced with age (Li et al., 2020). According to Developmental Psychopathology, suicidality manifests in diverse forms across early developmental stages, evolves over time, and exhibits individual differences (Oppenheimer et al., 2022). However, most existing studies focus on the static, cross-sectional aspects of suicidality in general (Reyes-Portillo et al., 2019) or clinical populations (Kang et al., 2021), leaving a gap in research on the dynamic changes in suicide risk among left-behind adolescents, and failing to capture the heterogeneous developmental patterns and their influencing factors over time. To address these concerns, this study adopted a person-centered perspective to explore the different developmental trajectories and multi-dimensional predictors of suicide risk among Chinese left-behind adolescents.

Suicide in Left-Behind Adolescents

Left-behind adolescents refers to youth whose parents, either one or both, have relocated for work, leaving them to continue residing in their hometown under the care of other family members such as grandparents or relatives, or even on their own (Duan & Zhou, 2005). With the rapid societal transformation in China, a significant labor force has moved to other areas (primarily cities) in search of better employment opportunities. Due to economic constraints and limited access to housing and educational resources, many parents have to leave their children behind, thus forming a large population of left-behind youth (Pan et al., 2021). As reported, the number of left-behind children in China had reached over 6.97 million, with those in middle

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school constituting approximately 21.8% of this population (Ministry of Civil Affairs PRC, 2019).

The absence of parental care not only disrupts the integrity of family structures but also significantly diminishes their emotional function, resulting in intermittent, long-distance, and infrequent parent-child communications among left-behind children (Shao et al., 2018). In this situation, parents become mere "spectators" to the adolescents' growth, not actively involved in their developmental process. The lack of effective supervision and emotional support in the family setting makes these left-behind individuals prone to psychological distress (Dai & Chu, 2018) and suicide risk (Xiao et al., 2020). A meta-analysis revealed that the prevalence of suicide ideation among Chinese left-behind adolescents was significantly higher than that of the non-left-behind (Qu et al., 2021). However, as a vulnerable group emerging amidst China's societal changes, suicidality among left-behind adolescents, although initially recognized, is predominantly addressed only in descriptive studies (Fellmeth et al., 2018; Lin et al., 2024). The dynamic follow-up and investigation into the influencing factors of their suicidality still lack in-depth exploration.

Developmental Trajectories of Suicide Risk

The Developmental Psychopathology provides a theoretical framework for understanding the development of suicidality, which posits that the emergence and escalation of suicidality typically begin in adolescence, and exhibits complex, dynamic variations due to a multitude of influencing factors (Oppenheimer et al., 2022). Research illustrated diverse developmental trajectories of suicidality among adolescents. For instance, studies have observed that suicide ideation in Korean adolescents formed an inverted U-shaped pattern, peaking during early to mid-adolescence and then decreasing (Park, 2013). Similarly, early adolescents' suicide attempt showed an exponential increase (Chung et al., 2022), while a decline in such behaviors among 15–17-year-olds has been found (Nakar et al., 2016). However, these studies often overlook the fact that the development of suicidality does not follow a uniform trajectory, and there can be qualitative differences even among individuals assessed as being at risk.

Recent studies have indicated that the development trajectories of adolescent suicidality are heterogeneous. For instance, a study tracking early American adolescents into mid-adulthood discovered distinct patterns: 9.2% exhibited an "adolescent-limited risk" trajectory, largely confined to ages 12–19, while 8.0% followed a "sustained higher risk" pattern and 82.8% maintained "sustained lower risk" patterns (Erausquin et al., 2019). Meanwhile, trajectories for suicide attempt were categorized as "declining higher risk" (4.6%) and "sustained lower risk" (95.4%). Research in China documented distinct trajectories for suicide ideation among adolescents over two years (Shen et al., 2024): "stable-low" (69.1%), "moderate-increasing" (13.6%), and "high-decreasing" (17.3%). Another study focusing on Canadian children and adolescents (Geoffroy et al., 2021), identified "never attempted" (96%), "limited to adolescence" (2%), and "persisting into adulthood" (2%) patterns of suicide attempt. Overall, researches typically categorizes the developmental trajectories of youth suicide ideation into three patterns, and suicide attempts are differentiated into two to three trajectories.

Despite these findings, researchers have primarily focused on the general adolescent population. For left-behind adolescents who lack sufficient support and resources, the exacerbation patterns and proportion of risks related to suicide might be more pronounced. However, there is limited knowledge in this vulnerable group. Additionally, existing studies often show limitations by focusing narrowly on specific aspects of suicidality, such as ideation (Liu et al., 2021) or attempts (Hedeland et al., 2016). Suicide risk is a complex, multi-dimensional concept that not only includes past behaviors and current ideation, but also encompasses the planning of suicide, the expression of suicide ideation, and the potential for actual attempts (Osman et al., 2001). Therefore, integrating these multiple dimensions is crucial for a deeper understanding of suicide risk among left-behind adolescents.

Multi-Contextual Predictors for Suicide Risk

Adolescence is replete with numerous challenges stemming from physiological, psychological, and social aspects (Danneel et al., 2019). While many elements offer opportunities for individual growth, they are also closely related to the risk of suicide. A comprehensive understanding of these factors is crucial for addressing suicide risk. For instance, identifying risk factors for suicide can help in promptly recognizing adolescents at high risk, thereby preventing the onset and escalation of suicidal behaviors. Clarifying protective factors can provide effective starting points for interventions, facilitating a positive transformation of suicide risk.

Due to the imperfect development of cognitive and psychological functions and immature coping styles, interpersonal violence (Li et al., 2021) and emotional disturbances (Wilkinson-Lee et al., 2011) become prevalent problems in the stage of early adolescence. This is especially pronounced for left-behind adolescents, who have been separated from their parents for long periods, perceive a sense of abandonment (Shao et al., 2018; Wan et al., 2023). Childhood maltreatment involves actions by adults responsible for the child that cause actual or potential harm

to the child's survival, development, or dignity (Bernstein et al., 1997). Bullying victimization refers to an individual repeatedly suffers deliberate attacks by one or more peers (Olweus, 2013), peaking during middle school (Hymel & Swearer, 2015). Experiences such as childhood maltreatment and bullying victimization represent severe interpersonal issues occurring within the two most crucial environments for adolescent development: home and school. The Interpersonal Theory of Suicide (Van Orden et al., 2010) and related researches (Fan & Li, 2023; Wu et al., 2023) have shown that left-behind adolescents who experience maltreatment and bullying are prone to recurring psychological issues like loneliness and low self-esteem, which in turn increase the risk of suicide. In terms of emotional disturbances, psychological pain (Li et al., 2019) and depression (Kang et al., 2021) are particularly associated with suicide risk. The Psychache Theory posits that psychological pain—a state of mental suffering characterized by intense negative emotions and caused by thwarted psychological needs—is the most direct cause of suicide (Shneidman, 1993). Depression refers to a long-term sad, unhappy emotional state (Zhang et al., 2022). Research has indicated that depression significantly increased the likelihood of an individual belonging to a trajectory of malignant development of suicide ideation compared to those in a "stably low" group (Adrian et al., 2016).

In addition to focusing on the impact of risk factors, the role of protective factors is equally crucial. The Buffering Hypothesis of suicide posits that positive protective factors can mitigate or inhibit the negative impact of risk factors on suicidal behaviors, particularly through individual belief resources (Johnson et al., 2011). Sense of control, defined as an individual's subjective perception of their ability to manage their psychological state, behaviors, and surrounding environment (Lachman & Weaver, 1998), plays a significant role. A high level of sense of control can enhance adolescents' motivation to cope, encouraging them to actively engage in problem-solving thinking and timely self-regulation. Consequently, this can lead to experiencing more positive emotions and achieving a greater sense of well-being (Seligman, 1975, 1991; Chen et al., 2020). Regulatory emotional self-efficacy, which refers to an individual's confidence in their ability to regulate their emotions (Bandura et al., 2003), is another protective factor. High-quality regulatory emotional self-efficacy can maintain self-regulatory mechanisms to some extent, enhance adolescents' positive expectations for the future, sustain a positive self-concept, help maintain lower levels of psychopathological symptoms, and promote mental health (Caprara et al., 2010; Lightsey et al., 2013). Moreover, demographic variables also merit attention in influencing the suicide risk among left-behind adolescents. Previous studies have noted that girls often report more suicide ideation and attempts than boys (Cha et al., 2018). Additionally, research indicated that suicide risk significantly increases with age among adolescents (Nock et al., 2013). Beyond gender and age, the place of residence may also play a role in adolescents' suicide risk. Studies have found that rural students generally have lower levels of mental health compared to urban students, and consequently, a higher suicide risk (Fontanella et al., 2015).

Although studies have verified the interrelationships between the aforementioned factors and suicide risk, most conclusions are based on variable-centered research, focusing primarily on the static and cross-sectional relationships. These approaches fail to clarify whether and how changes of predictors explain heterogeneity in the development of suicide risk. Moreover, when these factors operate concurrently, their independent contributions to suicide risk also remain unclear.

Current Study

Although informative findings on adolescents' suicide have been obtained, evidence regarding the developmental trajectories among left-behind youth is scarce. Correspondingly, the multifaceted influencing factors related to these potential developmental trajectories also remain to be explored. To address these gaps, this study set two main objectives. First, this study aimed to applying LCGM to explore the developmental trajectory of suicide risk among left-behind adolescents. According to the review of previous research, there would be at least two developmental trajectories: the majority of individuals exhibit a stable or decreasing pattern, while a minority follow an escalating trend. Second, this study aimed to examine how changes of predictors associated with the development patterns. It was expected that increased levels of childhood maltreatment, bullying victimization, depression, and psychological pain would raise the likelihood of falling into the malignant trajectory, whereas enhanced sense of control and regulatory emotional self-efficacy could decrease this likelihood.

Method

Participants and Procedure

Students from a middle school in Henan Provence, China, were surveyed at three time points: May 2022 (T1), November 2022 (T2), and May 2023 (T3). At T1, 1,651 students participated in the survey, of which 984 met the criteria to be considered left-behind adolescents, conceptualized as those whose one or both parents have migrated for work for more than six months, either previously or at the time of the survey. Due to transfers,

dropouts, and absences, 122 and 88 students did not participate in the surveys at T2 and T3, respectively. The valid sample consisted of 774 participants ranged in age from 11 to 15 years ($M = 13.60$, $SD = 0.77$), with 388 (50.1%) female students and 594 (76.7%) rural students.

This study received approval from the Medical Research Ethics Committee of the authors' institutions. Upon obtaining permission from the schools and informed consent from the participants and their parents, the researchers distributed questionnaires during class sessions, facilitated by the cooperation of the homeroom teachers. Detailed instructions on completing the questionnaires and maintaining confidentiality were provided. Participants were permitted to withdraw from the study at any point. Upon completion, the questionnaires were immediately collected and verified by the researchers. In this research, addressing the ethical concern of protecting participants from possible negative effects arising from inquiries about suicidality is crucial. Despite findings indicated that such inquiries do not significantly exacerbate suicide risk (Dazzi et al., 2014), we adopted specific precautions for adolescents identified as at-risk or potentially at-risk, particularly those left-behind. After the survey, we provided targeted interventions as needed, including mental health lectures and group counseling sessions, to address any emergent issues.

Measures

Parent-adolescent separation

Drawing on previous research (Su et al., 2013), the identity of left-behind adolescents is determined by three items: "What is the status of your parents working away from home (including both currently working away and having worked away in the past)?" with options 1 = both parents currently working away, 2 = only father is currently working away, 3 = only mother is currently working away, 4 = father previously worked away but is now at home, 5 = mother previously worked away but is now at home, 6 = both parents previously worked away but are now at home, 7 = neither parent has ever worked away. Additionally, "How often does your father who works away return home?" and "How often does your mother who works away return home?" with options being 1 = within 3 months, 2 = 3–6 months, 3 = 6–12 months, 4 = over a year, 5 = never worked away. Adolescents whose one or both parents have migrated for work for more than six months previously or currently are classified as left-behind.

Suicide risk

The Chinese version of the Suicidal Behaviors Questionnaire-Revised (SBQ-R) was used to measure suicide risk among left-behind adolescents (Osman et al., 2001; Zhao, 2006), which demonstrated good reliability and validity (Kang et al., 2019). The questionnaire contains four items, including lifetime suicide ideation and attempts (Have you ever considered or attempted suicide as long as you can remember? rated from 1 to 5), suicide ideation within the past year (How many times have you seriously considered ending your life in the past year? rated from 1 to 5), suicide threats (Have you ever told others that you intend to or might commit suicide? rated from 1 to 3), and likelihood of suicidal behavior (How likely is it that you will attempt suicide in the future? rated from 0 to 6). The total score ranges from 3 to 18 points, with higher scores indicating a higher risk of suicide. A score of 7 or higher indicates a significant risk of suicide. To better align with the research needs, this study adjusted the assessment period for the first two items of the SBQ-R to six months during the T2 and T3 phases. This approach follows the modifications made to the scale in existing studies (Liu et al., 2024; Ren et al., 2017). The Cronbach's alpha coefficients for SBQ-R at T1, T2, and T3 were 0.79, 0.80, and 0.81, respectively.

Childhood maltreatment

The Chinese version of the Childhood Trauma Questionnaire-Short Form (CTQ-SF) was used to assess the experiences of abuse and neglect among left-behind adolescents (Bernstein et al., 1997; Zhao et al., 2005). This scale consists of 25 items (e.g., "Someone at home hurt me so badly I had to go to the hospital.") covering five dimensions : physical abuse, physical neglect, emotional abuse, emotional neglect, and sexual abuse. It uses a 5-point Likert scale (1=*never*, 5=*always*). Higher scores indicate more severe abuse and neglect. The Cronbach's alpha coefficients for CTQ-SF at T1, T2, and T3 were 0.82, 0.84, and 0.84, respectively.

Bullying victimization

The Chinese version of the Delaware Bullying Victimization Scale-Student (DBVS-S) was used to assess the bullying victimization experienced by left-behind adolescents (Olweus, 2013; Xie et al., 2018). This scale includes 17 items (e.g., "A classmate threatened to harm me.") covering four dimensions : physical bullying, verbal bullying, social relational bullying, and cyberbullying. It uses a 6-point Likert scale (1 = *never*, 6 = *daily*). Higher scores indicate more severe experiences of bullying. The Cronbach's alpha coefficients for DBVS-S at T1, T2, and T3 were 0.91, 0.93, and 0.92, respectively.

Psychological pain

The Chinese version of the Psychache Scale (PS) was used to assess the psychological pain experienced by left-behind adolescents (Holden et al., 2001; Qin, 2008). This scale

consists of 13 items (e.g., "My pain almost broke me down."), utilizing a 5-point Likert scale (1 = *strongly disagree*, 5 = *strongly agree*). Higher total scores indicate greater levels of psychological pain. The Cronbach's alpha coefficients for PS at T1, T2, and T3 were 0.95, 0.96, and 0.97, respectively.

Depression

The Center for Epidemiologic Studies Depression Scale (CES-D) was used to measure the depression among left-behind adolescents (Radloff, 1977; Chen et al., 2009). This scale consists of 20 items (e.g., "I felt suppressed."), using a 4-point Likert scale (1 = *occasionally or not at all*, 4 = *most of the time*). Higher scores indicate higher levels of depression. The Cronbach's alpha coefficients for CES-D at T1, T2, and T3 were 0.88, 0.89, and 0.90, respectively.

Regulatory emotional self-efficacy

The Chinese version of the Regulatory Emotional Self-Efficacy Scale (RESES) was used to assess the self-efficacy in emotion regulation among left-behind adolescents (Caprara et al., 2008; Wen et al., 2009). This scale includes 12 items (e.g., "I could control my negative emotions when scolded by my parents or other important people."), covering three dimensions: self-efficacy in regulating depressed/distressed emotions, efficacy in expressing positive emotions, and self-efficacy in regulating anger. It utilizes a 5-point Likert scale (1 = *very uncharacteristic*, 5 = *very characteristic*). Higher scores indicate greater self-efficacy in emotion regulation. The Cronbach's alpha coefficients for RESES at T1, T2, and T3 were 0.84, 0.89, and 0.94, respectively.

Sense of control

The Chinese version of the Sense of Control Scale (SCS) was used to measure the sense of control among left-behind adolescents (Lachman & Weaver; 1998, Li, 2012). This scale consists of 12 items (e.g., "I could get what I want within my control."), encompassing two dimensions: personal mastery and perceived constraints. It uses a 7-point Likert scale (1 = *strongly disagree*, 7 = *strongly agree*). Higher total scores indicate a stronger sense of control. The Cronbach's alpha coefficients for SCS at T1, T2, and T3 were 0.70, 0.79, and 0.81, respectively.

Demographic variables

At the T1 time point, basic demographic information was collected, including age, gender (coded as 1 = female, 0 = male), and place of residence (coded as 1 = rural area, 0 = urban area).

Data Analysis

SPSS (version 26.0) and Mplus (version 8.3) were used for the the data analysis. First of all, descriptive statistics and correlational analyses of study variables were conducted. Then, Latent Class Growth Modeling (LCGM) was employed to identify different developmental trajectories of suicide risk. LCGM can be divided into two analysis parts: (1) Latent Growth Modeling (LGM) is used to depict specific change patterns. Specifically, the mean and variance of the intercept represent the initial value of the development trajectory and its within-group variation, respectively. The mean and variance of the slope represent the rate of change of the development trajectory and its within-group variation (Wickrama et al., 2016). As the study did not assume within-group variation, subsequent attention to the variance of intercepts and slope of LGM is not focused on. (2) Latent Class Analysis (LCA) was used to divide the heterogeneity categories of development trajectories (Nylund et al. 2007). Specifically, LGMs of 1–5 classes were established in sequence, and the optimal fit model was selected through model fit and comparison indices: a) Akaike Information Criteria (AIC), Bayesian Information Criteria (BIC), and Sample-size adjusted BIC (aBIC), b) Entropy, and c) adjusted Lo-Mendell-Rubin Likelihood Ratio test (LMR-LRT). Among them, lower AIC, BIC, and aBIC values indicate better model fit. Entropy value > 0.8 indicates high classification accuracy. A *p-value* < 0.05 for the LMR-LRT of the K-class model suggests that it fits better than the K-1 class model. Additionally, the selection of the model also needed to consider that the proportion of the smallest class is >5% of the total sample.

After determining the suicide risk development trajectory classes, the effects of multi-contextual factors were tested. Considering the developmental characteristics of adolescence, this study adopted a dynamic perspective to interpret the role of influencing factors. Specifically, this approach calculated the difference scores (i.e., T3 scores minus T1 scores) of childhood maltreatment, bullying victimization, depression, psychological pain, sense of control, and regulatory emotional self-efficacy to represent their changes (increases) over 12 months. Then, single factor analyses including one-way ANOVA and Wald χ^2 tests were used to compare the changes of study variables and demographic information across different trajectory classes. Lastly, significant variables from the univariate analyses were incorporated into multivariate logistic regression, to examine their impact on the development trajectories. It is important to note that the handling of predictor variables (excluding demographic variables) also considered other methodologies, such as using their baseline data (T1 scores) or the mean of T1, T2, and T3 scores, to provide alternative interpretations of how these predictors influence the

development of suicide risk. The corresponding analysis results were presented in the Supplementary Materials.

Results

Descriptive Results

Table 1 demonstrated the Mean scores, standardized Deviation, and Pearson correlates of suicide risk (at each time point), childhood maltreatment, bullying victimization, depression, psychological pain, sense of control, and regulatory emotional self-efficacy (at T1 and T3). The (positive or negative) correlations between all study variables were significant ($|r| \geq 0.141$, $p < 0.001$). Additionally, this study compared the prevalence of suicide risk between the study sample (left-behind adolescents) and non-left-behind adolescents. The results revealed that the prevalence of suicide risk among left-behind adolescents was 34.4%, significantly higher than the 18.9% among the non-left-behind counterparts ($\chi^2 = 50.73$, $p < 0.001$).

Trajectories of Suicide Risk

Unconditional LCGM were applied to explore the distinct trajectories of suicide risk. As shown in Table 2, the high entropy values in 1–5 class models indicated the high clarity of class assignments. The AIC, BIC, and aBIC values consistently decreased from 1-class to 4-class models but increased in 5-class model, indicating that the addition of a fifth class does not improve model fit and may instead introduce unnecessary complexity. Furthermore, within 4-class model, the Lo-Mendell-Rubin Likelihood Ratio test (LMR-LRT) was not significant ($p > 0.05$), indicating no substantial improvement in fit over the three-class model. Additionally, the smallest class in the 4-class model accounted for less than 5% of the sample, which may not be substantial enough to warrant distinct classification due to its minimal representation. Thus, the 3-class model is the best fit for understanding the different suicide risk trajectories among left-behind adolescents.

Scores of suicide risk in the three identified trajectory classes were depicted in Fig. 1. The first group, C1, encompassing 548 participants (70.8% of the sample), exhibited an initial suicide risk mean score of 5.162 (SE = 0.123, $p < 0.000$). This trajectory showed a notable decline in suicide risk levels, as evidenced by a slope mean of −0.845 (SE = 0.060, $p < 0.000$). Thus, C1 was labeled as *Low Risk-Diminishing*. C2, which included 167 participants (21.6%), had a higher starting mean suicide risk score of 7.523 (SE = 0.330, $p < 0.000$). The trajectory's slope mean of 0.139 (SE = 0.152, $p = 0.363$) indicated a stable (or slightly increasing) but risk pattern over the observed

Table 1 Basic descriptive information and correlations of study variables

Variables	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1 T1 suicide risk	1														
2 T2 suicide risk	0.646***	1													
3 T3 suicide risk	0.507***	0.677***	1												
4 T1 CM	0.391***	0.317***	0.207***	1											
5 T1 BV	0.384***	0.279***	0.201***	0.374***	1										
6 T1 depression	0.665***	0.433***	0.365***	0.470***	0.492***	1									
7 T1 PP	0.688***	0.463***	0.359***	0.489***	0.528***	0.766***	1								
8 T1 SOC	−0.356***	−0.238***	−0.227***	−0.288***	−0.317***	−0.385***	−0.478***	1							
9 T1 RESE	−0.378***	−0.310***	−0.206***	−0.315***	−0.264***	−0.342***	−0.457***	0.365***	1						
10 T3 CM	0.342***	0.373***	0.400***	0.392***	0.247***	0.299***	0.342***	−0.255***	−0.264***	1					
11 T3 BV	0.301***	0.333***	0.353***	0.285***	0.416***	0.257***	0.289***	−0.201***	−0.161***	0.308***	1				
12 T3 depression	0.480***	0.465***	0.629***	0.277***	0.334***	0.517***	0.457***	−0.261***	−0.232***	0.442***	0.417***	1			
13 T3 PP	0.467***	0.501***	0.594***	0.319***	0.332***	0.448***	0.524***	−0.330***	−0.302***	0.487***	0.465***	0.736***	1		
14 T3 SOC	−0.325***	−0.352***	−0.390***	−0.335***	−0.276***	−0.322***	−0.405***	0.450***	0.388***	−0.489***	−0.258***	−0.458***	−0.548***	1	
15 T3 RESE	−0.275***	−0.291***	−0.331***	−0.241***	−0.141***	−0.212***	−0.319***	0.226***	0.388***	−0.356***	−0.237***	−0.333***	−0.431***	0.428***	1
Mean	6.062	5.652	5.115	42.922	24.487	33.503	20.483	53.794	40.782	33.347	20.649	11.885	18.688	54.517	42.815
SD	3.338	3.194	3.044	8.265	9.424	9.505	9.031	8.872	7.711	8.873	6.667	9.252	8.378	9.553	8.996

CM childhood maltreatment, *BV* bullying victimization, *PP* psychological pain, *SOC* sense of control, *RESE* regulatory emotional self-efficacy, *SD* standard deviation

***$p < 0.001$

Table 2 Model fit indices for LCGM of suicide risk

Models	AIC	BIC	aBIC	Entropy	aLMR-LRT(p)	Smallest proportion
1-class	10167.289	10204.502	10179.098	–	–	–
2-class	9894.751	9945.918	9910.988	0.877	<0.001	16.3%
3-class	**9725.149**	**9790.271**	**9745.815**	**0.881**	**0.027**	**7.6%**
4-class	9569.877	9648.954	9594.971	0.895	0.053	3.0%
5-class	9575.878	9668.909	9605.400	0.800	0.040	3.2%

Bolded rows indicate preferred models with the best fitness

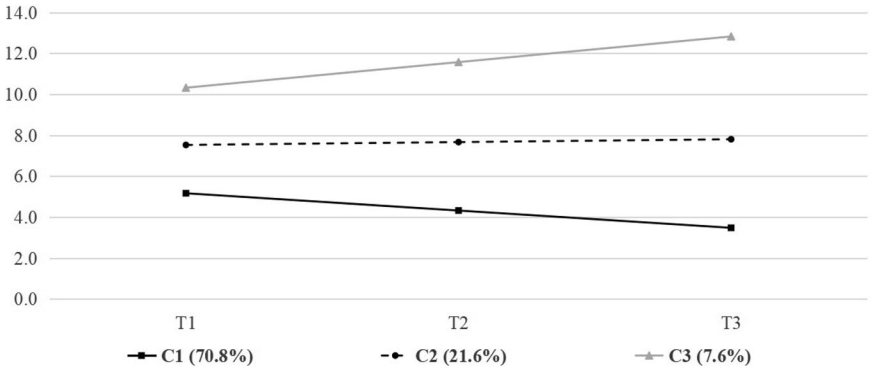

Fig. 1 Developmental trajectories of suicide risk

period, leading to the name *Risk-Holding*. C3 included 59 participants (7.6%) and began with the highest mean suicide risk score of 10.320 (SE = 0.618, $p < 0.000$). This group experienced a significant increase in suicide risk, as demonstrated by a slope mean of 1.253 (SE = 0.365, $p < 0.001$). Accordingly, this trajectory was named *High Risk-Escalating*.

Effects of Predictors on Suicide Risk Trajectories

The differences across three trajectory categories regarding variable score changes and demographic distribution were examined (see Table 3). All classes showed decreases in changes of childhood maltreatment (CM) and depression. *Low Risk-Diminishing* class exhibited the most reduction in CM ($\Delta CM = -10.655$) and depression ($\Delta depression = -22.454$), followed by *Risk-Holding* class ($\Delta CM = -7.877$; $\Delta depression = -20.698$), and *High Risk-Escalating* class showed the least reduction ($\Delta CM = -5.277$; $\Delta depression = -15.360$). Post-hoc tests indicated that the differences between each pair of groups were statistically significant ($p < 0.05$). Although the change of bullying victimization (BV) did not show overall differences, *Low Risk-Diminishing* class reported a more significant decrease than *Risk-Holding* class ($\Delta BV = -4.156$ and -2.488, $p < 0.05$). In terms of psychological pain (PP), *Low Risk-Diminishing* and *Risk-Holding* classes exhibited decreases ($\Delta PP = -2.685$ and -1.067, respectively), whereas *High Risk-Escalating* showed an increase ($\Delta PP = 4.566$), with significant differences between each pair of groups ($p < 0.05$).

Low Risk-Diminishing class reported increases in sense of control ($\Delta SOC = 1.475$) and regulatory emotional self-efficacy ($\Delta RESE = 2.968$). *Risk-Holding* class experienced a slight decrease in SOC ($\Delta SOC = -0.676$) and an increase in RESE ($\Delta RESE = 0.326$), while *High Risk-Escalating* class reported more substantial decreases in both SOC ($\Delta SOC = -4.610$) and RESE ($\Delta RESE = -0.964$). Their differences in pairwise comparisons were also significant ($p < 0.05$). Additionally, a notable difference is observed in gender distribution, the proportion of girls is significantly higher in *Risk-Holding* class and *High Risk-Escalating* classes compared to the *Low Risk-Diminishing* class ($p < 0.05$). Other demographic factors such as age and place of rural residence (POR) did not exhibit significant differences among the suicide risk trajectory classes.

Results of multinomial logistic regression analysis were presented in Table 4, predictors were examined for their impact on the likelihood of belonging to the *Risk-Holding* and *High Risk-Escalating* trajectory classes, with the *Low Risk-Diminishing* class as the reference group.

For the *Risk-Holding* class compared to the *Low Risk-Diminishing* class, changes in childhood maltreatment emerged as a risk predictor, with an odds ratio (OR) of 1.277 (SE = 0.106, $p = 0.021$; 95%*CI* [1.038, 1.571]), indicating that increases in CM are associated with higher odds of being in the *Risk-Holding* class. Changes in bullying victimization, depression, psychological pain and sense of control were not statistically significant predictors for this group. However, an increase in regulatory emotional self-efficacy (ΔRESE) was negatively associated with being in the *Risk-Holding* class (OR = 0.773, SE = 0.102,

Table 3 The difference in changes of variable scores among three trajectory classes

Variables	(1)LRD	(2)RH	(3)HRE	F/χ^2	p	Post-test
ΔCM	−10.655 ± 9.140	−7.877 ± 8.627	−5.277 ± 12.824	11.248	<0.001	(1) < (2) < (3)
ΔBV	−4.156 ± 7.979	−2.488 ± 10.519	−3.510 ± 12.482	1.986	0.138	(1) < (2)
Δdepression	−22.454 ± 8.100	−20.698 ± 10.053	−15.360 ± 12.462	15.799	<0.001	(1) < (2) < (3)
ΔPP	−2.685 ± 7.113	−1.067 ± 8.893	4.566 ± 14.345	18.987	<0.001	(1) < (2) < (3)
ΔSOC	1.475 ± 9.218	−0.676 ± 10.601	−4.610 ± 9.184	11.277	<0.001	(1) > (2) > (3)
ΔRESE	2.968 ± 9.484	0.326 ± 8.575	−0.964 ± 8.868	7.800	<0.001	(1) > (2),(3)
Age	13.624 ± 0.775	13.563 ± 0.765	13.468 ± 0.678	1.484	0.227	
Gender (girl)	253 (46.2%)	98 (58.7%)	37 (62.7%)	12.063	0.002	(1) < (2),(3)
POR (rural)	426 (77.7%)	124 (74.3%)	44 (74.6%)	1.040	0.595	

Values under three classes represent Mean ± Standard Deviation of variable scores or number (percentage) of participants. Post test is significant at $p < 0.05$

LRD Low Risk-Diminishing, *RH* Risk-Holding, *HRE* High Risk-Escalating

Table 4 Multinomial logistic regression of predictors on trajectory classes

Predictors	Risk-Holding				High Risk-Escalating			
	OR	SE	p	95%*CI*	OR	SE	p	95%*CI*
ΔCM	**1.277**	**0.106**	**0.021**	**[1.038,1.571]**	1.204	0.156	0.234	[0.887,1.637]
ΔBV	1.096	0.114	0.421	[0.876,1.372]	0.758	0.153	0.071	[0.562,1.024]
Δdepression	1.062	0.135	0.656	[0.815,1.382]	**1.523**	**0.214**	**0.049**	**[1.002,2.315]**
ΔPP	1.011	0.136	0.938	[0.774,1.319]	**1.592**	**0.200**	**0.020**	**[1.075,2.358]**
ΔSOC	0.851	0.106	0.127	[0.692,1.047]	**0.713**	**0.167**	**0.043**	**[0.514,0.989]**
ΔRESE	**0.773**	**0.102**	**0.012**	**[0.633,0.945]**	0.791	0.163	0.151	[0.575,1.089]
Gender (girl)	**1.930**	**0.197**	**0.001**	**[1.312,2.839]**	**2.631**	**0.326**	**0.003**	**[1.388,4.986]**

Low Risk-Diminishing is the reference group. Bolded rows emphasize the significant effects of corresponding predictors

$p = 0.012$; 95%*CI* [0.633, 0.945]). Gender (being a girl) significantly increased the odds of being in the *Risk-Holding* trajectory (OR = 1.930, SE = 0.197, $p = 0.001$; 95%*CI* [1.312, 2.839]).

For the *High Risk-Escalating* trajectory, the results suggested that increases in depression (OR = 1.523, SE = 0.214, $p = 0.049$; 95%*CI* [1.002, 2.315]) and psychological pain (OR = 1.592, SE = 0.200, $p = 0.020$; 95%*CI* [1.075, 2.358]) were associated with higher odds of falling into the *High Risk-Escalating* class compared to the *Low Risk-Diminishing* group. Additionally, an increase in sense of control (ΔSOC) was associated with a low likelihood of being in the *High Risk-Escalating* class (OR = 0.713, SE = 0.167, $p = 0.043$; 95%*CI* [0.514, 0.989]). Gender also played a significant role, with being female increasing the odds of being in the *High Risk-Escalating* class (OR = 2.631, SE = 0.326, $p = 0.003$; 95%*CI* [1.388, 4.986]).

The results of difference tests and logistic regression analyses, where the levels of childhood maltreatment, bullying victimization, psychological pain, sense of control, and regulatory emotional self-efficacy were treated as baseline and mean scores, are detailed in the supplementary materials (refer to Supplementary Tables S1–S4).

Discussion

Suicide poses significant and incalculable risks to the adaptation and development of Chinese left-behind adolescents. However, previous research has not fully understood the developmental nature of suicide risk among left-behind adolescents. Moreover, how changes of predictors influence the development of suicide risk has not been explored. Therefore, this study employed a person-centered and longitudinal design to address the research gaps. Three developmental trajectories of suicide risk among Chinese left-behind adolescents were identified: *High Risk-Escalating*, *Risk-Holding* and *Low Risk-Diminishing*. Increased levels of childhood maltreatment, psychological pain, depression, sense of control and regulatory emotional self-efficacy were significantly associated with the risk trajectories.

Suicide Risk Trajectories in Left-Behind Adolescents

This study discovered notable heterogeneity in the developmental trajectories of suicide risk among left-behind adolescents, identifying three distinct types: *High Risk-Escalating*, *Risk-Holding*, and *Low Risk-Diminishing*.

These findings are consistent with three categories of suicidality trajectories previously identified in the general population (Kim et al., 2019; Adrian et al., 2016). This supports the notion that the developmental patterns of suicide risk have a universal nature across different groups. The *Low Risk-Diminishing* category, comprising 70.8% of the students, started with the lowest level of suicide risk and maintained a low level over time. This supports the perspective of Positive Youth Development, which posits that adolescents inherently possess the potential for positive development and are likely to progress favorably over time (Damon, 2004).

The developmental trajectories of the other two risk subgroups are of significant value for understanding and intervening in suicidal behaviors among left-behind adolescents. Over one-fifth (21.6%) of these adolescents belong to the *Risk-Holding* category, starting with an initial level of suicide risk above the critical threshold and maintaining a relatively stable state of danger in later development. More concerning is the *High Risk-Escalating* group, which comprises 7.6% of all students, starting with the highest level of suicide risk and showing a rapidly worsening trend. Overall, nearly 30% exhibit a malignant developmental pattern of suicide, a proportion higher than the proportion in the general population (Thompson & Swartout, 2018), highlighting the severe threat of the left-behind experience on adolescent suicide.

The reasons for these patterns may include the emotional instability, anxiety, and other personality traits more likely to develop among adolescents in left-behind situations, who also face numerous psychosocial stressors such as developmental and environmental adaptation difficulties and poor problem-solving abilities (Zhao & Yu, 2016; Dong et al., 2022). It indicates that left-behind adolescents trapped in a malignant suicide development pattern are a critical focus for school mental health professionals, who should monitor and support them continuously. It is essential to use various methods for psychological counseling and to design targeted interventions to prevent the occurrence of suicide. Cooperation with families should also be strengthened to enhance emotional connections between parents and children, provide proper educational guidance, and actively participate in the growth and development of left-behind adolescents.

Predictors of Suicide Risk Trajectories in Left-Behind Adolescents

When discussing the developmental trajectories of suicide risk, trauma-related factors such as childhood maltreatment and bullying victimization are often considered significant risk factors. However, this study found that the impact of these traumatic experiences was not consistent in predicting different developmental trajectories of suicide risk. Specifically, compared to the *Low Risk-Diminishing* trajectory, increased childhood maltreatment had a significant association with the *Risk-Holding* trajectory of suicide risk, indicating that left-behind adolescents who experienced more severe childhood maltreatment exhibit higher and relatively stable suicide risk. Bullying victimization, on the other hand, did not show the same predictive power. This suggests that different types of traumatic experiences may affect the suicide risk of left-behind adolescents through different psychological mechanisms. Within the Chinese cultural context, which places a strong emphasis on familial relationships. Childhood maltreatment, especially sustained and systemic maltreatment, can have a long-term and profound impact on the psychological development of left-behind adolescents (Badr et al., 2018). This impact might manifest as the formation of maladaptive self-cognitions, impaired emotional regulation, and difficulties in interpersonal relationships, thereby maintaining a relatively high level of suicide risk throughout adolescence (De Bellis & Zisk, 2014; Lee & Hoaken, 2007). In contrast to childhood maltreatment, although bullying victimization is a severe interpersonal trauma, its effects on the adaptation and developmental outcomes of left-behind adolescents may not be as direct or significant due to variations in the environment of occurrence, frequency, duration, and individual coping resources (Yang et al., 2023), suggesting that family influence on left-behind adolescents might exceed that of peers. Moreover, research has indicated that bullying victimization does not directly predict an individual's suicide risk but rather operates through mediators such as emotional distress (Hong et al., 2023). This study confirms from a developmental perspective that emotional distress increases the likelihood of falling into a suicide crisis, rather than bullying victimization per se. This indicates that bullying victimization may affect the maladaptive development of left-behind adolescents through emotional distress. However, due to the limitations of this study's design, this conclusion requires further verification through subsequent research.

Emotional problems such as depression and psychological pain significantly increase the likelihood that an individual will fall into the *High Risk-Escalating* category, meaning that increases in depression and psychological pain can drive the malignant development of suicide risk among left-behind adolescents. Adolescents suffering from depression often find themselves in a state of exhaustion, lose positive expectations for the future, and indulge in catastrophic emotions. They are also more likely to focus on negative information in their environment, leading to narrow and negative cognition (Hankin, 2006; Hu et al., 2022). As a result, when dealing with stressful events, depressed left-behind adolescents may not be able to devise

constructive coping strategies and may instead become fixated on the idea that suicide is the only way out, thus increasing their likelihood of falling into a suicidal crisis. The Psychache Theory suggests that when psychological pain exceeds the maximum threshold of endurance and there is no anticipated positive change in the future, individuals may despair and believe they will forever endure this pain. At this point, left-behind adolescents may reduce their cognitive processing to view suicide as the only method to end their psychological pain (Shneidman, 1993; Ducasse et al., 2018). Additionally, compared to children and adults, adolescents in their teenage years are more sensitive to experiences of depression and psychological pain (Rothenberg et al., 2019). However, due to an "emotional disconnection" from their parents, they are unable to obtain timely and effective support and assistance, making the depression and psychological pain they experience even more profound and prolonged (Akezhuoli et al., 2022). Therefore, over time, the suicide risk among left-behind adolescents tends to increase.

Regarding protective factors, improved sense of control is negatively associated with the *High Risk-Escalating* trajectory, while enhanced regulatory emotional self-efficacy significantly reduces the likelihood of an individual falling into the *Risk-Holding* category. These findings highlight the importance of fostering positive beliefs in individuals to prevent suicide risk. Left-behind adolescents with a increased sense of control are more inclined to adopt proactive coping strategies and engage in positive self-regulation, and they have higher expectations of control over their future (Oi & Alwin, 2017). As a result, they are better able to adapt to their environment and curb the rise in suicide risk. This indicates that enhancing the sense of control could be key in preventing the development of suicide risk in the *High Risk-Escalating* group. Similarly, improving regulatory emotional self-efficacy can be an effective way to reduce suicide risk among left-behind adolescents. Those with high regulatory emotional self-efficacy can effectively manage their negative emotions and maintain positive cognitions and experiences when faced with stressful situations (Mesurado et al., 2018). This not only promotes the healthy development of psychological resources but also helps optimize their personality structure (Alessandri et al., 2023), thereby significantly lowering their likelihood of becoming high-risk individuals for suicide.

Additionally, significant gender differences exist in the latent developmental trajectories of suicide risk among left-behind adolescents. Compared to the *Low Risk-Diminishing* group, the proportion of girls in the *Risk-Holding* and *High Risk-Escalating* groups is significantly higher than that of boys, aligning with previous research which identifies girls as a more vulnerable population to suicide risk (Veloso-Besio et al., 2023). This vulnerability may be due to earlier physical and psychological development in adolescent girls, leading to more internal conflicts and contradictions. Girls typically have a weaker capacity to adapt to new environments, experience greater emotional fluctuations, and tend to overthink when facing issues, resulting in a lower psychological resilience. Therefore, in the early warning and prevention of suicide among left-behind adolescents, it is crucial to pay special attention to gender differences. Providing additional support to girls can help develop a more targeted and comprehensive prevention and control system. This tailored approach is essential to effectively address and mitigate the heightened risk of suicide among female left-behind students.

Limitations and Future Directions

This study has several limitations. First, it only examined the heterogeneity in suicide risk among left-behind adolescents during early adolescence and did not track their development into middle and late adolescence. Future research should extend these findings throughout the entire adolescent period. Second, the study only sampled students from one school, which limits the representativeness of the findings. Future studies could improve the generalizability of the conclusions by expanding the sampling scope. Lastly, in this study, victimization bullying did not significantly predict the developmental trajectories of suicide risk among left-behind adolescents. However, due to the limitations in the design, the reasons for this were not thoroughly investigated. Future research could further explore the condition of bullying victimization among left-behind adolescents to clarify its deep mechanisms affecting suicide risk.

Implications

This study yields significant implications. Firstly, this study emphasizes that adolescence is a critical period for screening the suicide risk among left-behind adolescents and also serves as a vital window for preventing and intervening in the escalation of their suicide risk. Secondly, adolescents categorized as *High Risk-Escalating* and *Risk-Holding* groups report higher levels of suicide risk and are more likely to engage in suicidal behaviors in the future. While most left-behind adolescents possess a "self-healing" capability and are likely to progress towards flourishing states over time (Damon, 2004), those in the aforementioned categories exhibit contrary developmental trends. Therefore, schools and families should strive to identify such high-risk adolescents and flexibly implement various intervention programs to prevent crises, such as Cognitive Behavioral Therapy (CBT) for suicide prevention, which can help restructure their adaptive thinking and enhance problem-solving skills to reduce their vulnerability to suicide (Stanley et al., 2009).

Considering that childhood maltreatment, psychological pain, and depression are significant drivers of maladaptive development among left-behind adolescents, mental health educators should provide timely psychological counseling to those who have suffered from childhood maltreatment. This counseling should aim to reshape positive recognition, boost self-esteem, and thereby reduce their suicide risk. Schools and families should also closely monitor emotional fluctuations in left-behind adolescents, heighten awareness of their depression and psychological pain, and provide timely guidance and intervention to prevent the exacerbation of suicidal behaviors.

Lastly, schools and relevant authorities should also intervene with left-behind adolescents by focusing on enhancing their sense of control and regulatory emotional self-efficacy. For those with low sense of control, training programs such as Stop Now And Plan (SNAP) should be implemented to provide more encouragement, focusing on mastering self-control strategies (Augimeri et al., 2017). Emotional regulation education courses or activities should be used as platforms to help left-behind adolescents learn proper ways to express their emotions, increase positive emotional experiences, and gradually establish sound emotional regulation beliefs.

Conclusion

Despite the severity of suicide risk among left-behind youth, existing research has limited understanding of its developmental nature, let alone the associated factors. This study, using a sample of Chinese left-behind adolescents and employing a longitudinal design across three time points, explored the trajectories of suicide risk and the effects of multi-contextual predictors. Results revealed three distinct suicide risk trajectories. The majority belonged to the *Low Risk-Diminishing* group, but approximately 30% exhibited *Risk-Holding* and *High Risk-Escalating* patterns. Being a female and the increase in factors such as childhood maltreatment, psychological pain, and depression were positively associated with *Risk-Holding* and/or *High Risk-Escalating* trajectories, while increased regulatory emotional self-efficacy and sense of control were negatively associated with worsening trends. The results emphasize the marked heterogeneity in the suicide risk trajectories of left-behind adolescents and highlight the need for enhanced psychological support and monitoring mechanisms for those with persistent or increasing risks. Focusing on the corresponding predictors is crucial for identifying the developmental trajectories and may mitigate suicide risk.

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.

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Compliance with Ethical Standards

Conflict of Interest The authors declare no competing interests.

Ethical Approval All procedures performed in this study were in accordance with the recommendations of the Research Ethics Committee of the the first authors' institution and with the 1964 Declaration of Helsinki.

Informed Consent Informed consent was obtained from all individual participants included in the study.

References

Adrian, M., Miller, A. B., McCauley, E., & Vander Stoep, A. (2016). Suicidal ideation in early to middle adolescence: Sex-specific trajectories and predictors. *Journal of Child Psychology and Psychiatry*, *57*(5), 645–653. https://doi.org/10.1111/jcpp.12484.

Akezhuoli, H., Lu, J. J., Zhao, G. L., Xu, J. Y., Wang, M. M., Wang, F., Li, L., & Zhou, X. D. (2022). Mother's and father's migrating in China: Differing relations to mental health and risk behaviors among left-behind children. *Frontiers in Public Health*, *10*, 894741. https://doi.org/10.3389/fpubh.2022.894741.

Alessandri, G., Tavolucci, S., Perinelli, E., Eisenberg, N., Golfieri, F., Caprara, G. V., & Crocetti, E. (2023). Regulatory emotional self-efficacy beliefs matter for (mal) adjustment: A meta-analysis. *Current Psychology*, *42*(35), 31004–31023. https://doi.org/10.1007/s12144-022-04099-3.

Augimeri, L. K., Walsh, M., Donato, A., Blackman, A., & Piquero, A. R. (2017). SNAP (Stop Now And Plan): Helping children improve their self-control and externalizing behavior problems. *Journal of Criminal Justice*, *56*, 43–49. https://doi.org/10.1016/j.jcrimjus.2017.08.010.

Badr, H. E., Naser, J., Al-Zaabi, A., Al-Saeedi, A., Al-Munefi, K., Al-Houli, S., & Al-Rashidi, D. (2018). Childhood maltreatment: A predictor of mental health problems among adolescents and young adults. *Child Abuse and Neglect*, *80*, 161–171. https://doi.org/10.1016/j.chiabu.2018.03.011.

Bandura, A., Caprara, G. V., Barbaranelli, C., Gerbino, M., & Pastorelli, C. (2003). Role of affective self-regulatory efficacy in diverse

spheres of psychosocial functioning. *Child Development*, *74*(3), 769–782. https://doi.org/10.1111/1467-8624.00567.

Bernstein, D. P., Ahluvalia, T., Pogge, D., & Handelsman, L. (1997). Validity of the childhood trauma questionnaire in an adolescent psychiatric population. *Journal of the American Academy of Child and Adolescent Psychiatry*, *36*(3), 340–348. https://doi.org/10.1097/00004583-199703000-00012.

Caprara, G. V., Gerbino, M., Paciello, M., Di Giunta, L., & Pastorelli, C. (2010). Counteracting depression and delinquency in late adolescence: The role of regulatory emotional and interpersonal self-efficacy beliefs. *European Psychologist*, *15*(1), 34–48. https://doi.org/10.1027/1016-9040/a000004.

Caprara, G., Giunta, L., Eisenberg, N., Gerbino, M., Pastorelli, C., & Tramontano, C. (2008). Assessing regulatory emotional self-efficacy in three countries. *Psychological Assessment*, *20*, 227–237. https://doi.org/10.1037/1040-3590.20.3.227.

Chen, B., Luo, L. J., Wu, X., Chen, Y. J., & Zhao, Y. F. (2020). Are the lower class really unhappy? Social class and subjective well-being in Chinese adolescents: Moderating role of sense of control and mediating role of self-esteem. *Journal of Happiness Studies*, *22*(2), 825–843. https://doi.org/10.1007/s10902-020-00253-5.

Chen, Z. Y., Yang, X. D., & Li, X. Y. (2009). Psychometric features of CES-D in Chinese adolescents. *Chinese Journal of Clinical Psychology*, *17*(4), 443–445.

Cha, C. B., Franz, P. J., Guzman, E. M., Glenn, C. R., Kleiman, E. M., & Nock, M. K. (2018). Annual research review: Suicide among youth-epidemiology, (potential) etiology, and treatment. *Journal of Child Psychology and Psychiatry*, *59*(4), 460–482. https://doi.org/10.1111/jcpp.12831.

Chung, S., Hovmand, P., McBride, A. M., & Joiner, T. (2022). Suicide attempts during adolescence: Testing the system dynamics of the interpersonal theory of suicide. *Journal of Adolescence*, *94*(4), 628–641. https://doi.org/10.1002/jad.12051.

Dai, Q., & Chu, R. X. (2018). Anxiety, happiness and self-esteem of western Chinese left-behind children. *Child Abuse and Neglect*, *86*, 403–413. https://doi.org/10.1016/j.chiabu.2016.08.002.

Damon, W. (2004). What is positive youth development? *Annals of the American Academy of Political and Social Science*, *591*, 13–24. https://doi.org/10.1177/0002716203260092.

Danneel, S., Nelemans, S., Spithoven, A., Bastin, M., Bijttebier, P., Colpin, H., Van Den Noortgate, W., Van Leeuwen, K., Verschueren, K., & Goossens, L. (2019). Internalizing problems in adolescence: Linking loneliness, social anxiety symptoms, and depressive symptoms over time. *Journal of Abnormal Child Psychology*, *47*(10), 1691–1705. https://doi.org/10.1007/s10802-019-00539-0.

Dazzi, T., Gribble, R., Wessely, S., & Fear, N. T. (2014). Does asking about suicide and related behaviours induce suicidal ideation? What is the evidence? *Psychological Medicine*, *44*(16), 3361–3363. https://doi.org/10.1017/S0033291714001299.

De Bellis, M. D., & Zisk, A. (2014). The biological effects of childhood trauma. *Child and Adolescent Psychiatric Clinics of North America*, *23*(2), 185–222. https://doi.org/10.1016/j.chc.2014.01.002.

Dong, Y. H., Liu, F. F., Jiang, Y. J., & Wei, S. Y. (2022). Neuroticism and aggressive behavior among left-behind children: The mediating roles of interpersonal sensitivity and bullying victimization. *International Journal of Environmental Research and Public Health*, *19*(17), 11072. https://doi.org/10.3390/ijerph191711072.

Duan, C. R., & Zhou, F. L. (2005). A study on children left behind. *Population Research*, *1*, 29–36.

Ducasse, D., Holden, R. R., Boyer, L., Artero, S., Calati, R., Guillaume, S., Courtet, P., & Olie, E. (2018). Psychological pain in suicidality: A meta-analysis. *Journal of Clinical Psychiatry*, *79*(3), 16r10732. https://doi.org/10.4088/JCP.16r10732.

Erausquin, J. T., McCoy, T. P., Bartlett, R., & Park, E. (2019). Trajectories of suicide ideation and attempts from early adolescence to mid-adulthood: Associations with race/ethnicity. *Journal of Youth and Adolescence*, *48*(9), 1796–1805. https://doi.org/10.1007/s10964-019-01074-3.

Fan, X. Y., & Li, X. P. (2023). Direct and indirect effects of child maltreatment on suicidal ideation among Chinese left-behind children: Does gender make a difference? *Behavioral Sciences*, *12*(11), 464. https://doi.org/10.3390/bs12110464.

Fellmeth, G., Rose-Clarke, K., Zhao, C. Y., Busert, L. K., Zheng, Y. T., Massazza, A., Sonmez, H., Eder, B., Blewitt, A., Lertgrai, W., Orcutt, M., Ricci, K., Mohamed-Ahmed, O., Burns, R., Knipe, D., Hargreaves, S., Hesketh, T., Opondo, C., & Devakumar, D. (2018). Health impacts of parental migration on left-behind children and adolescents: A systematic review and meta-analysis. *Lancet*, *392*(10164), 2567–2582. https://doi.org/10.1016/S0140-6736(18)32558-3.

Fontanella, C. A., Hiance-Steelesmith, D. L., Phillips, G. S., Bridge, J. A., Lester, N., Sweeney, H. A., & Campo, J. V. (2015). Widening rural-urban disparities in youth suicides, United States, 1996-2010. *JAMA Pediatrics*, *169*(5), 466–473. https://doi.org/10.1001/jamapediatrics.2014.3561.

Geoffroy, M. C., Orri, M., Girard, A., Perret, L. C., & Turecki, G. (2021). Trajectories of suicide attempts from early adolescence to emerging adulthood: Prospective 11-year follow-up of a Canadian cohort. *Psychological Medicine*, *51*(11), 1933–1943. https://doi.org/10.1017/S0033291720000732.

Hankin, B. L. (2006). Adolescent depression: Description, causes, and interventions. *Epilepsy and Behavior*, *8*(1), 102–114. https://doi.org/10.1016/j.yebeh.2005.10.012.

Hedeland, R. L., Teilmann, G., Jorgensen, M. H., Thiesen, L. R., & Andersen, J. (2016). Risk factors and characteristics of suicide attempts among 381 suicidal adolescents. *Acta Paediatrica*, *105*(10), 1231–1238. https://doi.org/10.1111/apa.13458.

Holden, R. R., Mehta, K., Cunningham, E. J., & McLeod, L. D. (2001). Development and preliminary validation of a scale of psychache. *Canadian Journal of Behavioural Science*, *33*(4), 224–232. https://doi.org/10.1037/h0087144.

Hong, J. S., Choi, J., Burlaka, V., Burlaka, J., Marsack-Topolewski, C. N., & Voisin, D. R. (2023). Bullying victimization and suicidal thoughts: Emotional distress and neighborhood conditions. *Archives of Suicide Research*. https://doi.org/10.1080/13811118.2023.2192755.

Hu, S. W., Mo, D. M., Guo, P. F., Zheng, H. Y., Jiang, X. L., & Zhong, H. (2022). Correlation between suicidal ideation and emotional memory in adolescents with depressive disorder. *Scientific Reports*, *12*(1), 5470. https://doi.org/10.1038/s41598-022-09459-4.

Hymel, S., & Swearer, S. M. (2015). Four decades of research on school bullying an introduction. *American Psychologist*, *70*(4), 293–299. https://doi.org/10.1037/a0038928.

Johnson, J., Wood, A. M., Gooding, P., Taylor, P. J., & Tarrier, N. (2011). Resilience to suicidality: The buffering hypothesis. *Clinical Psychology Review*, *31*(4), 563–591. https://doi.org/10.1016/j.cpr.2010.12.007.

Kang, C. Y., Zheng, Y., Yang, L. Y., Wang, X. H., Zhao, N., Guan, T. F., Qiu, S. Y., Shi, J. J., & Hu, J. (2021). Prevalence, risk factors and clinical correlates of suicidal ideation in adolescent patients with depression in a large sample of Chinese. *Journal of Affective Disorders*, *290*, 272–278. https://doi.org/10.1016/j.jad.2021.04.073.

Kang, N., You, J., Huang, J., Ren, Y., Lin, M. P., & Xu, S. (2019). Understanding the pathways from depression to suicidal risk from the perspective of the Interpersonal-Psychological Theory of Suicide. *Suicide and Life-Threatening Behavior*, *49*(3), 684–694. https://doi.org/10.1111/sltb.12455.

Kim, J., Pike, K., McCauley, E., & Vander Stoep, A. (2019). Ethnic variations of trajectories in suicide ideation and attempt: From middle school to high school. *Suicide and Life-Threatening Behavior*, *49*(2), 432–443. https://doi.org/10.1111/sltb.12441.

Lachman, M. E., & Weaver, S. L. (1998). The sense of control as a moderator of social class differences in health and well-being. *Journal of Personality and Social Psychology*, *74*(3), 763–773. https://doi.org/10.1037/0022-3514.74.3.763.

Lee, V., & Hoaken, P. N. S. (2007). Cognition, emotion, and neurobiological development: Mediating the relation between maltreatment and aggression. *Child Maltreatment*, *12*(3), 281–298. https://doi.org/10.1177/1077559507303778.

Li, J. (2012). The study of attribution tendency in the rich-poor gap for different social classes. [Unpublished doctoral dissertation, Central China Normal University]. China National Knowledge Internet. https://www.cnki.net/.

Li, M. L., Ren, Y. J., & Sun, H. (2020). Social anxiety status of left-behind children in rural areas of Hunan province and its relationship with loneliness. *Child Psychiatry and Human Development*, *51*(6), 1016–1024. https://doi.org/10.1007/s10578-020-01045-x.

Li, S., Chen, X., Ran, G., Zhang, Q., & Li, R. (2021). Shyness and internalizing problems among Chinese adolescents: The roles of independent interpersonal stress and rumination. *Children and Youth Services Review*, *128*, 106151. https://doi.org/10.1016/j.childyouth.2021.106151.

Li, X. A., You, J. N., Ren, Y. X., Zhou, J. Z., Sun, R. H., Liu, X. L., & Leung, F. (2019). A longitudinal study testing the role of psychache in the association between emotional abuse and suicidal ideation. *Journal of Clinical Psychology*, *75*(12), 2284–2292. https://doi.org/10.1002/jclp.22847.

Lightsey, O. R., McGhee, R., Ervin, A., Gharghani, G. G., Rarey, E. B., Daigle, R. P., Wright, K. F., Constantin, D., & Powell, K. (2013). Self-efficacy for affect regulation as a predictor of future life satisfaction and moderator of the negative affect-life satisfaction relationship. *Journal of Happiness Studies*, *14*(1), 1–18. https://doi.org/10.1007/s10902-011-9312-4.

Lin, K., Ramos, S., & Sun, J. (2024). Urbanization, self-harm, and suicidal ideation in left-behind children and adolescents in China: A systematic review and meta-analysis. *Current Opinion in Psychiatry*, *37*(3), 225–236. https://doi.org/10.1097/YCO.0000000000000927.

Liu, R. T., Lawrence, H. R., Burke, T. A., Sanzari, C. M., Levin, R. Y., Maitlin, C., Paszek, C., & Zhu, X. R. (2021). Passive and active suicidal ideation among left-behind children in rural China: An evaluation of intrapersonal and interpersonal vulnerability and resilience. *Suicide and Life-Threatening Hehavior*, *51*(6), 1213–1223. https://doi.org/10.1111/sltb.12802.

Liu, Y. X., Zhang, S., Yang, L., & Wang, L. L. (2024). Exploration of the short-term dynamic variation in suicidal ideation and its risk factors among college students: Based on interpersonal theory of suicide. *Chinese Journal of Clinical Psychology*, *32*(1), 32–38. https://doi.org/10.16128/j.cnki.1005-3611.2024.01.006.

Mesurado, B., Vidal, E. M., & Mestre, A. (2018). Negative emotions and behaviour: The role of regulatory emotional self-efficacy. *Journal of Adolescence*, *64*, 62–71. https://doi.org/10.1016/j.adolescence.2018.01.007.

Ministry of Civil Affairs of the People's Republic of China. (2019). Proposal on strengthening the care and protection of left-behind children in rural areas. https://xxgk.mca.gov.cn:8445/gdnps/pc/content.jsp?mtype=4&id=15314.

Nakar, O., Brunner, R., Schilling, O., Chanen, A., Fischer, G., Parzer, P., Carli, V., Wasserman, D., Sarchiapone, M., Wasserman, C., Hoven, C. W., Resch, F., & Kaess, M. (2016). Developmental trajectories of self-injurious behavior, suicidal behavior and substance misuse and their association with adolescent borderline personality pathology. *Journal of Affective Disorders*, *197*, 231–238. https://doi.org/10.1016/j.jad.2016.03.029.

Nock, M. K., Green, J. G., Hwang, I., McLaughlin, K. A., Sampson, N. A., Zaslavsky, A. M., & Kessler, R. C. (2013). Prevalence, correlates, and treatment of life time suicidal behavior among adolescents: Results from the national comorbidity survey replication adolescent supplement. *JAMA Psychiatry*, *70*(3), 300–310. https://doi.org/10.1001/2013.jamapsychiatry.55.

Nylund, K., Bellmore, A., Nishina, A., & Graham, S. (2007). Subtypes, severity, and structural stability of peer victimization: What does latent class analysis say? *Child Development*, *78*(6), 1706–1722. https://doi.org/10.1111/j.1467-8624.2007.01097.x.

Oi, K., & Alwin, D. F. (2017). Children's sense of control as a determinant of adult health: Causation, mediation, and spuriousness. *Journal of Health and Social Behavior*, *58*(2), 198–216. https://doi.org/10.1177/0022146517692012.

Olweus, D. (2013). School Bullying: Development and some important challenges. *Annual Review of Clinical Psychology*, *9*, 751–780. https://doi.org/10.1146/annurev-clinpsy-050212-185516.

Oppenheimer, C. W., Glenn, C. R., & Miller, A. B. (2022). Future directions in suicide and self-injury revisited: Integrating a developmental psychopathology perspective. *Journal of Clinical Child and Adolescent Psychology*, *51*(2), 242–260. https://doi.org/10.1080/15374416.2022.2051526.

Osman, A., Bagge, C. L., Gutierrez, P. M., Konick, L. C., Kopper, B. A., & Barrios, F. X. (2001). The Suicidal Behaviors Questionnaire-Revised (SBQ-R): Validation with clinical and nonclinical samples. *Assessment*, *8*(4), 443–454. https://doi.org/10.1177/107319110100800409.

Pan, W. G., Gao, B. X., Long, Y. H., Teng, Y., & Yue, T. (2021). Effect of caregivers' parenting styles on the emotional and behavioral problems of left-behind children: The parallel mediating role of self-control. *International Journal of Environmental Research and Public Health*, *18*(23), 12714. https://doi.org/10.3390/ijerph182312714.

Park, S. (2013). Predictors of suicidal ideation in late childhood and adolescence: A 5-year follow-up of two nationally representative cohorts in the republic of Korea. *Suicide and Life-Threatening Hehavior*, *43*(1), 81–96. https://doi.org/10.1111/j.1943-278X.2012.00129.x.

Qin, Y. F. (2008). Research of influence of perfectionism and psychache on suicide ideation of college students. [Master's thesis, Central China Normal University]. China National Knowledge Internet. https://www.cnki.net/.

Qu, G. B., Shu, L. Q., Zhang, J., Wu, Y. L., Ma, S. D., Han, T. T., Zhang, H. M., Wang, J., & Sun, Y. (2021). Suicide ideation, suicide plan, and suicide attempt among left-behind children and adolescents: A systematic review and meta-analysis. *Suicide and Life-Threatening Hehavior*, *51*(3), 515–527. https://doi.org/10.1111/sltb.12731.

Radloff, L. S. (1977). The CES-D scale: A self-report depression scale for research in the general population. *Applied Psychological Measurement*, *1*(3), 385–401. https://doi.org/10.1177/014662167700100306.

Ren, Y. X., Zhang, X., You, J. N., Jiang, Y. Q., Lin, M. P., & Leung, F. (2017). The reciprocal associations between identity disturbance, relationship disturbance, and suicidal ideation among Chinese adolescents: A three-wave cross-lag study. *Journal of Clinical Psychology*, *74*(7), 1174–1188. https://doi.org/10.1002/jclp.22573.

Reyes-Portillo, J. A., Lake, A. M., Kleinman, M., & Gould, M. S. (2019). The relation between descriptive norms, suicide ideation, and suicide attempts among adolescents. *Suicide and Life-Threatening Hehavior*, *49*(2), 535–546. https://doi.org/10.1111/sltb.12446.

Rothenberg, W. A., Di Giunta, L., Lansford, J. E., Lunetti, C., Fiasconaro, I., Basili, E., Thartori, E., Favini, A., Pastorelli, C., Eisenberg, N., D'Amico, F., Rosa, M., & Cirimele, F. (2019). Daily associations between emotions and aggressive and depressive symptoms in adolescence: The mediating and moderating role of emotion dysregulation. *Journal of Youth and Adolescence*, *48*(11), 2207–2221. https://doi.org/10.1007/s10964-019-01071-6.

Seligman, M. E. P. (1975). *Helplessness: On depression, development, and death*. San Francisco: Freeman.

Seligman, M. E. P. (1991). *Learned optimism*. New York: Knopf.

Shao, J. J., Zhang, L., Ren, Y. N., Xiao, L. X., & Zhang, Q. H. (2018). Parent-child cohesion, basic psychological needs satisfaction, and emotional adaptation in left-behind children in China: An indirect effects model. *Frontiers in Psychology*, *9*, 1023. https://doi.org/10.3389/fpsyg.2018.01023.

Shen, Y., Chen, D. R., Guo, J. Q., Zheng, Y., Zhang, J. J., Zhan, S. T., & You, J. N. (2024). Co-developmental trajectories of suicidal ideation and non-suicidal self-injury among Chinese adolescents: Trans-diagnostic predictors and association with suicide attempts. *Suicide and Life-Threatening Behavior*. https://doi.org/10.1111/sltb.13074.

Shneidman, E. S. (1993). Suicide as psychache. *Journal of Nervous and Mental Disease*, *181*(3), 145–147. https://doi.org/10.1097/00005053-199303000-00001.

Stanley, B., Brown, G., Brent, D. A., Wells, K., Poling, K., Curry, J., Kennard, B. D., Wagner, A., Cwik, M. F., Klomek, A. B., Goldstein, T., Vitiello, B., Barnett, S., Daniel, S., & Hughes, J. (2009). Cognitive-Behavioral Therapy for Suicide Prevention (CBT-SP): Treatment model, feasibility, and acceptability. *Journal of The American Academy of Child and Adolescent Psychiatry*, *48*(10), 1005–1013. https://doi.org/10.1097/CHI.0b013e3181b5dbfe.

Su, S., Li, X., Lin, D., Xu, X., & Zhu, M. (2013). Psychological adjustment among left-behind children in rural China: The role of parental migration and parent. *child communication. Child Care Health and Development*, *39*(2), 162–170. https://doi.org/10.1111/j.1365-2214.2012.01400.x.

Thompson, M. P., & Swartout, K. (2018). Epidemiology of suicide attempts among youth transitioning to adulthood. *Journal of Youth and Adolescence*, *47*(4), 807–817. https://doi.org/10.1007/s10964-017-0674-8.

Van Orden, K. A., Witte, T. K., Cukrowicz, K. C., Braithwaite, S. R., Selby, E. A., & Joiner, T. E. (2010). The interpersonal theory of suicide. *Psychological Review*, *117*(2), 575–600. https://doi.org/10.1037/a0018697.

Veloso-Besio, C., Cuadra-Peralta, A., Gallardo-Peralta, L., Cuadra-Fernandez, P., Quiroz, P. T., & Troncoso, N. V. (2023). The prevalence of suicide attempt and suicidal ideation and its relationship with aggression and bullying in Chilean adolescents. *Frontiers in Psychology*, *14*, 1133916. https://doi.org/10.3389/fpsyg.2023.1133916.

Wan, G. W., Deng, C., & Li, C. (2023). Adverse childhood experiences and depression: Do left-behind families place children at higher risk in rural China. *Journal of Family Violence*. https://doi.org/10.1007/s10896-023-00580-0.

Wen, S., Tang, D., & Yu, G. (2009). The characteristics of regulatory emotional self-efficacy in Chinese graduate students. *Psychological Science*, *32*(3), 666–668. https://doi.org/10.16719/j.cnki.1671-6981.2009.03.025.

Wickrama, K., Lee, T. K., O'Neal, C. W., & Lorenz, F. (2016). *Higher-order growth curves and mixture modeling with Mplus: A practical guide*. Routledge.

Wilkinson-Lee, A. M., Zhang, Q. H., Nuno, V. L., & Wilhelm, M. S. (2011). Adolescent emotional distress: The role of family obligations and school connectedness. *Journal of Youth and Adolescence*, *40*(2), 221–230. https://doi.org/10.1007/s10964-009-9494-9.

Wu, D. H., Chen, S. Y., Chen, Y., Li, D., & Yin, H. Z. (2023). The impact of peer victimization on Chinese left-behind adolescent suicidal ideation: The mediating role of psychological suzhi and the moderating role of family cohesion. *Child Abuse and Neglect*, *141*, 106235. https://doi.org/10.1016/j.chiabu.2023.106235.

Xiao, Y. Y., He, L. P., Chang, W., Zhang, S. N., Wang, R., Chen, X. W., Li, X. J., Wang, Z. Y., & Risch, H. A. (2020). Self-harm behaviors, suicidal ideation, and associated factors among rural left-behind children in west China. *Annals of Epidemiology*, *42*, 42–49. https://doi.org/10.1016/j.annepidem.2019.12.014.

Xie, J. S., Wei, Y. M., & Bear, G. (2018). Revision of Chinese version of delaware bullying victimization scale-student in adolescents[Chinese]. *Chinese Journal of Clinical Psychology*, *26*(2), 59–263. https://doi.org/10.16128/j.cnki.1005-3611.2018.02.011.

Yang, L., Xiong, Y. K., Gao, T., Li, S. M., & Ren, P. (2023). A person-centered approach to resilience against bullying victimization in adolescence: Predictions from teacher support and peer support. *Journal of Affective Disorders*, *341*, 154–161. https://doi.org/10.1016/j.jad.2023.08.089.

Zhang, R., Xie, R. B., Ding, W., Wang, X. Y., Song, S. C., & Li, W. J. (2022). Why is my world so dark? Effects of child physical and emotional abuse on child depression: The mediating role of self-compassion and negative automatic thoughts. *Child Abuse and Neglect*, *129*, 105677. https://doi.org/10.1016/j.chiabu.2022.105677.

Zhao, F. Q., & Yu, G. L. (2016). Parental migration and rural left-behind children's mental health in China: A meta-analysis based on mental health test. *Journal of Child and Family Studies*, *25*(12), 3462–3472. https://doi.org/10.1007/s10826-016-0517-3.

Zhao, J. B. (2006). Influencing of life meaning and cognitive factors on suicidal ideation among medical college students. [Master's thesis, Southern Medical University]. China National Knowledge Internet. https://www.cnki.net/.

Zhao, X. F., Zhang, Y. L., Li, L. F., & Zhou, Y. F. (2005). Evaluation on reliability and validity of Chinese version childhood trauma questionnaire. *Chinese Journal of Clinical Rehabilitation*, *9*(16), 209–211. https://doi.org/10.3321/j.issn:1673-8225.2005.16.037.

Zhu, J. X., Li, Y. L., Zhang, C. C., He, J., & Niu, L. (2023). Trends in mortality and causes of death among Chinese adolescents aged 10-19 years from 1990 to 2019. *Frontiers in Public Health*, *11*, 1075858. https://doi.org/10.3389/fpubh.2023.1075858.

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