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Latent Growth Curve Modeling of Rumination Subtypes and Suicidal Ideation in High-Risk Adolescents

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A B S T R A C T

Objective: The present study aimed to examine longitudinal trajectories of brooding and reflective rumination and to determine their parallel predictive effects on changes in suicidal ideation among high-risk adolescents using a latent growth curve modeling framework.

Methods and Materials: A prospective four-wave longitudinal design was employed with a sample of 362 high-risk adolescents aged 13–17 years recruited from secondary schools and youth mental health services. Participants completed validated self-report measures of brooding and reflective rumination, suicidal ideation, and depressive symptoms at three-month intervals over a 12-month period. Measurement invariance across time was established prior to growth analyses. Unconditional latent growth curve models were first estimated separately for brooding, reflection, and suicidal ideation to assess intercepts and linear slopes. A parallel process latent growth model was subsequently specified to examine whether baseline levels and rates of change in rumination subtypes predicted trajectories of suicidal ideation while controlling for depressive symptoms and gender. Model fit was evaluated using CFI, TLI, RMSEA, and SRMR indices, and missing data were handled using full information maximum likelihood estimation.

Findings: Results indicated significant positive linear growth in brooding and suicidal ideation over time, with substantial inter-individual variability in slopes. Reflective rumination demonstrated a stable mean trajectory but significant slope variance. In the parallel process model, the brooding intercept significantly predicted the suicidal ideation intercept ($\beta = .41$, $p < .001$), and the brooding slope significantly predicted growth in suicidal ideation ($\beta = .38$, $p < .001$). Reflective rumination did not significantly predict changes in suicidal ideation trajectories. Depressive symptoms remained a significant covariate of baseline suicidal ideation. Overall model fit indices indicated good structural fit.

Conclusion: Findings identify brooding, but not reflective rumination, as a dynamic longitudinal risk mechanism contributing to escalating suicidal ideation among high-risk adolescents, underscoring the importance of targeting maladaptive rumination processes in prevention and intervention efforts.

Keywords: *Adolescent suicide; Brooding; Reflective rumination; Suicidal ideation; Latent growth curve modeling; Cognitive vulnerability.*

1. Introduction

Adolescent suicide remains a pressing global public health crisis, ranking among the leading causes of death for young people worldwide. Over the past decade, epidemiological evidence has demonstrated a troubling rise in suicidal ideation, suicide attempts, and non-suicidal self-injury across diverse cultural contexts. Clinical registry data from youth mental health services indicate that a substantial proportion of adolescents seeking treatment report active suicidal thoughts or recent attempts (Kennard et al., 2023). Parallel evidence from primary care and early intervention settings highlights the pervasiveness of suicidality among help-seeking youth, underscoring the need for developmentally informed risk models (Albrecht et al., 2025). Particularly elevated rates have been documented among adolescents at ultra-high risk for psychosis, suggesting that suicidality may cluster within specific psychiatric vulnerability profiles (Ang et al., 2025).

Recent systematic reviews and meta-analyses further reveal that suicidal behaviors are not uniformly distributed across youth populations but are shaped by intersecting biological, psychosocial, and contextual factors. For example, meta-analytic evidence indicates that adolescents with chronic medical conditions such as type 1 diabetes show increased rates of suicidal ideation and attempts compared to peers (Renaud-Charest et al., 2024). Youth residing in frontier and remote regions may experience compounded risks due to reduced service access and social isolation (Kreuze, 2024). Similarly, polygenic risk profiling studies suggest that genetic liability for psychiatric traits contributes to early vulnerability to suicidality, even in preadolescent populations (Joo et al., 2021). These findings converge with longitudinal cohort data demonstrating that early-life adversities, including trauma exposure and childhood stressors, prospectively predict suicidal ideation across adolescence (Marr et al., 2021; Orri et al., 2022).

Within high-risk subgroups, disparities are particularly pronounced among sexual and gender diverse youth. Transgender and gender diverse adolescents report markedly elevated rates of suicidal ideation and self-injury (McArthur, 2026). Systematic reviews conducted during the COVID-19 pandemic document heightened mental health and substance use difficulties among sexual and gender minority youth, further exacerbating suicide risk (Racine et al., 2025). Longitudinal analyses indicate that peer victimization partially mediates the association between minority identity and suicidality (Liu et al., 2025), while online racial discrimination and cyber-victimization similarly predict increased suicidal ideation through traumatic stress pathways (Tynes et al., 2024). Among incarcerated or justice-involved sexual and gender minority youth, mental health burden and suicide risk are even more pronounced (Clark et al., 2022).

Beyond minority stress, family and interpersonal processes constitute central determinants of adolescent suicide risk. Social connectedness has been repeatedly identified as a protective factor buffering suicidal ideation (Arango et al., 2023). Multilevel analyses demonstrate that parental involvement reduces the likelihood of suicidal thoughts in school-based samples (Long et al., 2021). Conversely, deficits in family functioning and diminished perceived support are robustly associated with greater suicidal ideation and behaviors (Nestor et al., 2022; Wong et al., 2022). In LGBTQ+ populations, family support has been shown to moderate mental health outcomes and mitigate suicide risk in primary care contexts (DelFerro et al., 2024). Cultural family processes similarly shape depressive symptoms and suicidal ideation trajectories among Asian American youth (Lee et al., 2023).

At the individual level, cognitive-affective mechanisms have gained increasing attention as proximal risk factors. Emotion-related impulsivity and rumination exhibit both unique and interactive associations with suicidal ideation and attempts (Johnson et al., 2022). In depressive outpatient samples, rumination and self-criticism are strongly linked to suicidal ideation, suggesting that repetitive negative thinking patterns may sustain and amplify distress (Lo & Cheng, 2024). Chain mediation analyses demonstrate that rumination functions as an intermediary mechanism connecting non-suicidal self-injury to suicidal ideation (Zheng et al., 2023). Furthermore, suicide-related rumination has emerged as a significant correlate of suicidal behaviors in representative epidemiological youth samples, even when controlling for family functioning and population-level stressors (Wong et al., 2022).

Neurocognitive and affective processes further illuminate this risk architecture. At-risk suicidal individuals exhibit dissociated deficits in anticipated versus experienced regret, implicating maladaptive decision-making processes in suicidality (Ai et al., 2023). Sleep disturbances in preadolescence prospectively predict suicidal behaviors, highlighting dysregulation in basic regulatory systems (Gowin et al., 2024). Emotional dysregulation and thwarted belongingness have been directly targeted in web-assisted behavioral interventions to reduce suicidal ideation, with

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preliminary evidence of efficacy (Hill et al., 2022). Decentering capacities have been identified as moderators in the relation between non-suicidal self-injury and suicidal ideation, suggesting that cognitive flexibility may buffer maladaptive rumination (Rosario-Williams et al., 2021).

Importantly, suicidal ideation frequently co-occurs with other psychopathological manifestations. Youth hospitalized with eating disorders demonstrate high lifetime rates of suicidal ideation and attempts (Arnold et al., 2023). Adolescents with chronic pain conditions such as juvenile fibromyalgia exhibit both elevated suicide risk and resilience factors that moderate outcomes (Gmuca et al., 2021). Studies examining adverse childhood experiences reveal interactive effects between trauma exposure and suicidal thoughts on subsequent substance use behaviors (Kelly et al., 2023). Even in non-ideating youth engaging in non-suicidal self-injury, distinct correlates differentiate this group from adolescents endorsing suicidal ideation (Boylan et al., 2025).

Socioeconomic and structural determinants also contribute to suicide risk. Parental education has been systematically associated with youth suicidal behaviors, indicating broader socioeconomic gradients in risk distribution (Chen et al., 2022). Trends analyses in large metropolitan samples reveal shifting patterns of suicidality and bullying across race and sexual identity over time (English et al., 2024). Earthquake exposure interacting with genetic polymorphisms demonstrates the role of gene–environment interplay in adolescent suicidal ideation (Cai et al., 2024). Justice involvement does not necessarily extinguish suicidal risk, as suicidal thoughts and behaviors may persist following juvenile justice contact (Kemp et al., 2021). Screening research further underscores ethnic differences in depression and suicidality assessment validity among adjudicated youth (Gagnon et al., 2025).

Notably, longitudinal investigations of interpersonal theory constructs among LGBTQ+ youth utilizing crisis services demonstrate that thwarted belongingness and perceived burdensomeness predict suicidal ideation trajectories, moderated by gender identity (Chang et al., 2021). Cross-sectional and longitudinal analyses in urban youth populations corroborate the importance of support processes in shaping suicidal ideation transitions (Nestor et al., 2022). Despite this expanding body of evidence, most studies remain cross-sectional or rely on two-wave designs, limiting the capacity to capture developmental change and heterogeneity in trajectories. Few investigations employ advanced growth modeling frameworks to simultaneously examine intra-individual change and inter-individual variability in cognitive risk factors and suicidal ideation over time.

Emerging digital mental health approaches attempt to monitor and intervene in youth suicidal ideation in real-world clinical settings (Chong et al., 2024), yet precise identification of dynamic risk mechanisms remains essential for tailoring interventions. Rumination, particularly maladaptive brooding, has been consistently implicated as a proximal cognitive vulnerability; however, differentiation between rumination subtypes and their distinct longitudinal contributions to suicidal ideation trajectories remains insufficiently explored. Furthermore, transitional analyses highlight that perceived support and suicidal ideation demonstrate complex bidirectional associations across late adolescence (Nestor et al., 2022). Contemporary epidemiological research continues to document persistent disparities and contextual stressors shaping youth suicidality (McArthur, 2026; Racine et al., 2025).

Given the convergence of evidence implicating cognitive processes, social connectedness, minority stress, trauma exposure, and structural determinants in adolescent suicide risk, there is a pressing need to clarify how specific cognitive vulnerabilities unfold developmentally within high-risk populations. Latent growth curve modeling offers a powerful methodological approach to examine both baseline levels and rates of change in rumination subtypes and suicidal ideation, allowing for the identification of parallel developmental processes and individual variability. Building upon existing longitudinal and meta-analytic findings while addressing methodological limitations in prior research, the present study aims to model the developmental trajectories of brooding and reflective rumination and to examine their longitudinal associations with suicidal ideation among high-risk adolescents.

2. Methods and Materials

2.1. Study Design and Participants

This study employed a prospective longitudinal design to investigate developmental trajectories of rumination subtypes and their predictive associations with suicidal ideation among high-risk adolescents in Armenia. Data were collected across four waves over a 12-month period with approximately three-month intervals between assessments. The target population consisted of adolescents identified as high-risk based on prior exposure to at least one of the following criteria: documented depressive symptomatology above clinical cut-off, history of self-harm or suicide

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attempt, exposure to significant interpersonal trauma, or referral from school psychologists due to persistent emotional distress. Participants were recruited from public secondary schools and community mental health centers in Yerevan and two regional provinces. A multi-stage cluster sampling procedure was implemented. First, six secondary schools and two community-based youth counseling centers were selected in collaboration with the Armenian Ministry of Education, Science, Culture and Sport. Within these institutions, screening procedures were conducted using brief standardized measures of depressive symptoms and self-injurious thoughts to identify eligible adolescents. From an initial screened pool of 612 students, 428 met high-risk criteria. Of these, 362 adolescents provided both parental consent and personal assent and agreed to participate in the longitudinal study. At baseline (Time 1), the final sample consisted of 362 participants (196 females, 166 males), aged between 13 and 17 years (M = 15.02, SD = 1.21). Attrition across waves was monitored carefully; retention rates were 94.7% at Time 2, 91.2% at Time 3, and 88.1% at Time 4. Full information maximum likelihood procedures were used to address missing data under the assumption of missing at random. Inclusion criteria required sufficient Armenian language proficiency, enrollment in formal schooling, and absence of severe cognitive impairment. Adolescents currently hospitalized for acute psychiatric crises at baseline were excluded to ensure stability during longitudinal follow-up.

2.2. *Measures*

Data collection tools were selected based on strong psychometric properties and prior validation in adolescent populations. Rumination was assessed using the Armenian-adapted version of the Ruminative Responses Scale (RRS), which differentiates between brooding and reflective pondering subtypes. The brooding subscale captures passive and judgmental comparisons of one's current state with unachieved standards, whereas the reflection subscale assesses purposeful turning inward to engage in cognitive problem-solving. The translation and cultural adaptation process followed forward–backward translation procedures, expert panel review, and pilot testing with 48 Armenian adolescents to ensure semantic and conceptual equivalence. Internal consistency coefficients (Cronbach's alpha) at baseline were .89 for brooding and .84 for reflection. Suicidal ideation was measured using the Suicidal Ideation Questionnaire–Junior (SIQ-JR), adapted for Armenian adolescents. This instrument assesses frequency and severity of suicidal thoughts during the past month using a Likert-type response format. Baseline internal consistency for the SIQ-JR in the current sample was .93. Depressive symptoms were assessed as a time-varying covariate using the Patient Health Questionnaire for Adolescents (PHQ-A), which demonstrated acceptable internal consistency (α = .87). In addition, demographic information including age, gender, socioeconomic status, parental education, and prior mental health treatment history was collected via a structured background questionnaire. All instruments were administered in classroom settings or counseling rooms under standardized conditions by trained clinical psychology graduate students. To reduce social desirability bias and enhance reporting accuracy, adolescents completed questionnaires individually, with adequate spacing and privacy. At each wave, participants were screened for acute suicide risk; those scoring above the critical threshold on the SIQ-JR were immediately referred to school psychologists or collaborating mental health professionals for further evaluation and safety planning.

2.3. *Data Analysis*

Data analysis was conducted using structural equation modeling within a latent growth curve modeling (LGCM) framework to examine intra-individual change and inter-individual variability in trajectories of rumination subtypes and suicidal ideation over time. Analyses were performed using Mplus version 8.8 and cross-validated in R using the lavaan package. Preliminary analyses included descriptive statistics, assessment of normality (skewness and kurtosis indices), and evaluation of internal consistency reliability for all measures at each time point. Measurement invariance across time was tested for the brooding, reflection, and suicidal ideation constructs using a sequential approach including configural, metric, and scalar invariance models. Model fit was evaluated using multiple indices, including the Comparative Fit Index (CFI $\geq$ .95 for good fit), Tucker–Lewis Index (TLI $\geq$ .95), Root Mean Square Error of Approximation (RMSEA $\leq$ .06), and Standardized Root Mean Square Residual (SRMR $\leq$ .08). Unconditional latent growth models were first estimated separately for brooding, reflection, and suicidal ideation to determine initial levels (intercepts) and rates of change (linear slopes). Subsequently, parallel process latent growth models were specified to examine whether baseline levels and trajectories of rumination subtypes predicted initial status and growth in

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suicidal ideation. Gender and depressive symptoms were included as covariates to control for potential confounding effects. Random intercept and random slope variances were freely estimated to capture individual differences in developmental trajectories. Indirect effects were examined using bias-corrected bootstrap confidence intervals with 5,000 resamples. Sensitivity analyses were conducted to evaluate the robustness of findings under alternative model specifications, including quadratic growth factors where indicated by significant non-linear trends. Statistical significance was set at $p < .05$, and effect sizes were interpreted using standardized estimates.

3. Findings and Results

Descriptive statistics, internal consistency indices, and bivariate correlations among the primary study variables at baseline (Time 1) are presented in Table 1. These results provide an overview of the central tendency, dispersion, reliability, and preliminary associations between brooding, reflection, suicidal ideation, and depressive symptoms in the high-risk Armenian adolescent sample. Prior to conducting latent growth analyses, assumptions of normality and multicollinearity were examined. Skewness and kurtosis values for all continuous variables fell within acceptable ranges (−1.50 to +1.50), indicating no substantial deviation from univariate normality. Internal consistency coefficients were satisfactory to excellent across measures.

Table 1

Descriptive Statistics, Internal Consistency, and Correlations Among Study Variables at Time 1 (N = 362)

Variable	M	SD	α	1	2	3	4
1. Brooding	15.87	4.62	.89	—			
2. Reflection	13.42	3.98	.84	.46**	—		
3. Suicidal Ideation	18.35	8.74	.93	.58**	.29**	—	
4. Depressive Symptoms	16.71	6.15	.87	.63**	.37**	.69**	—

**p < .01

As shown in Table 1, brooding exhibited a moderate to strong positive correlation with suicidal ideation ($r = .58$, $p < .01$) and depressive symptoms ($r = .63$, $p < .01$), indicating that adolescents who engaged in more maladaptive ruminative comparison processes reported higher levels of suicidal thoughts and depressive affect at baseline. Reflection was moderately correlated with brooding ($r = .46$, $p < .01$), suggesting partial overlap between rumination subtypes; however, its association with suicidal ideation ($r = .29$, $p < .01$) was notably weaker than that of brooding. Depressive symptoms demonstrated the strongest bivariate association with suicidal ideation ($r = .69$, $p < .01$), supporting its inclusion as a time-varying covariate in subsequent structural models. Internal consistency values ranged from .84 to .93, confirming adequate reliability of all measures in this sample.

Table 2

Unconditional Latent Growth Model Parameters for Brooding, Reflection, and Suicidal Ideation (Four Waves)

Construct	Intercept Mean	Intercept Variance	Slope Mean	Slope Variance	CFI	TLI	RMSEA	SRMR
Brooding	15.82**	9.41**	0.64**	0.87**	.97	.96	.042	.035
Reflection	13.39**	7.26**	0.18	0.52*	.95	.94	.051	.041
Suicidal Ideation	18.29**	24.33**	0.91**	1.76**	.98	.97	.039	.029

*p < .05, **p < .01

Results from Table 2 indicate that the mean intercept for brooding was statistically significant ($M = 15.82$, $p < .01$), reflecting elevated baseline levels of maladaptive rumination in this high-risk sample. The positive and significant slope mean ($M = 0.64$, $p < .01$) suggests a gradual linear increase in brooding across the 12-month follow-up. Significant slope variance (0.87, $p < .01$) indicates substantial inter-individual differences in growth trajectories. Reflection showed a significant intercept but a non-significant slope mean ($M = 0.18$, $p > .05$), suggesting relative stability over time at the group level, although significant slope variance (0.52, $p < .05$) implies

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heterogeneity in individual patterns. Suicidal ideation demonstrated both a significant intercept and a significant positive slope (M = 0.91, p < .01), indicating that, on average, suicidal thoughts increased over time in this high-risk cohort. The large slope variance (1.76, p < .01) further underscores considerable variability in developmental trajectories.

Table 3

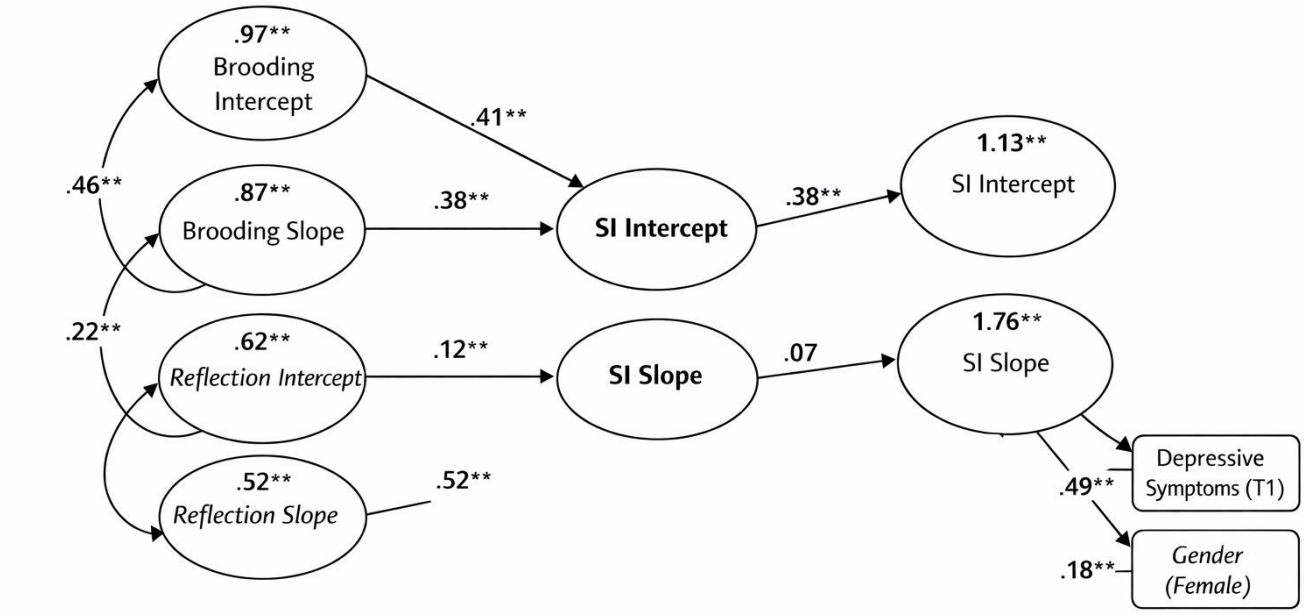
Parallel Process Latent Growth Model: Standardized Path Coefficients Predicting Suicidal Ideation Trajectories

Predictor → Outcome	β	SE	p
Brooding Intercept → SI Intercept	.41	.06	< .001
Brooding Slope → SI Slope	.38	.08	< .001
Reflection Intercept → SI Intercept	.12	.05	.021
Reflection Slope → SI Slope	.07	.06	.214
Depressive Symptoms (T1) → SI Intercept	.49	.07	< .001
Gender (Female) → SI Intercept	.18	.05	.003

The results presented in Table 3 demonstrate that baseline levels of brooding significantly predicted baseline suicidal ideation (β = .41, p < .001), even after controlling for depressive symptoms and gender. Moreover, increases in brooding over time significantly predicted increases in suicidal ideation trajectories (β = .38, p < .001), indicating that adolescents whose maladaptive rumination intensified were more likely to experience escalating suicidal thoughts. In contrast, reflection showed only a small effect on initial suicidal ideation (β = .12, p = .021) and did not significantly predict growth in suicidal ideation over time (β = .07, p = .214). Depressive symptoms remained a robust predictor of initial suicidal ideation (β = .49, p < .001), and female gender was associated with higher baseline suicidal ideation (β = .18, p = .003). Overall model fit indices were satisfactory (CFI = .96, TLI = .95, RMSEA = .045, SRMR = .037), supporting adequacy of the specified structural model.

Figure 1

Parallel Process Latent Growth Model of Brooding, Reflection, and Suicidal Ideation Trajectories



As depicted in Figure 1, the structural model illustrates significant covariance between brooding and suicidal ideation growth factors, with a pronounced path from brooding slope to suicidal ideation slope. The graphical representation underscores the dynamic coupling between maladaptive rumination and suicidal ideation across

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adolescence. Reflection trajectories appear comparatively weakly linked to suicidal ideation change. The figure further demonstrates the substantial variance in both intercept and slope factors, reinforcing the heterogeneity of developmental risk patterns within this Armenian high-risk adolescent sample. Collectively, these findings indicate that brooding, rather than reflective pondering, functions as a longitudinal risk mechanism contributing to the escalation of suicidal ideation over time.

4. Discussion

The present longitudinal study examined developmental trajectories of brooding and reflective rumination and their parallel associations with suicidal ideation among high-risk adolescents. Consistent with our hypotheses, brooding demonstrated a significant positive growth trajectory over the 12-month period and emerged as a robust predictor of both baseline levels and increases in suicidal ideation. In contrast, reflective rumination showed relative stability at the group level and did not significantly predict growth in suicidal ideation when controlling for depressive symptoms and gender. These findings underscore the differential role of rumination subtypes in the developmental course of suicidality and highlight brooding as a dynamic cognitive risk mechanism in vulnerable youth populations.

The observed increase in suicidal ideation across waves aligns with epidemiological data documenting persistent or escalating suicidal thoughts among treatment-seeking adolescents (Kennard et al., 2023). Similar persistence has been noted in justice-involved youth, where suicidal ideation and behaviors may continue even after system contact (Kemp et al., 2021). Our finding that suicidal ideation trajectories display significant inter-individual variability further supports prior longitudinal evidence demonstrating heterogeneous developmental patterns in youth suicidality (Nestor et al., 2022). This heterogeneity suggests that static risk models may inadequately capture the dynamic nature of suicide risk, reinforcing the value of latent growth approaches.

The strong predictive effect of brooding on both intercept and slope of suicidal ideation is consistent with theoretical and empirical work identifying maladaptive rumination as a proximal vulnerability factor. Emotion-related impulsivity and rumination have shown conjoint effects on suicidal ideation and attempts across adolescent samples (Johnson et al., 2022). Chain mediation models have further demonstrated that rumination mediates the association between non-suicidal self-injury and suicidal ideation (Zheng et al., 2023). In epidemiological youth samples, suicide-related rumination has been significantly associated with suicidal behaviors even after accounting for family functioning and broader stressors (Wong et al., 2022). Our longitudinal findings extend these cross-sectional and short-term analyses by demonstrating that increases in brooding over time are directly associated with increases in suicidal ideation, suggesting a developmental coupling process rather than merely concurrent association.

Neurocognitive evidence may help explain this coupling. At-risk suicidal individuals exhibit deficits in anticipated and experienced regret processing, reflecting maladaptive decision-making and cognitive inflexibility (Ai et al., 2023). Such impairments may render adolescents more susceptible to perseverative negative thinking patterns characteristic of brooding. Furthermore, sleep disturbances have been prospectively linked to subsequent suicidal behaviors in preadolescence (Gowin et al., 2024), and disrupted sleep may exacerbate rumination through impaired emotion regulation. Collectively, these findings support a model in which brooding amplifies negative affect and hopeless cognitions, progressively heightening suicidal ideation.

In contrast, reflective rumination did not significantly predict changes in suicidal ideation trajectories. Although reflection was modestly associated with baseline suicidal ideation, its slope was unrelated to suicidal ideation growth. This pattern suggests that reflection may function as a more neutral or context-dependent cognitive process, potentially facilitating problem-solving under certain conditions. Prior research differentiating rumination subtypes similarly indicates that brooding, rather than reflection, drives associations with suicidal outcomes (Lo & Cheng, 2024). Our results corroborate this differentiation within a longitudinal growth framework.

The persistence of depressive symptoms as a strong predictor of baseline suicidal ideation aligns with evidence from clinical registries and primary care samples indicating high co-occurrence between depression and suicidality (Albrecht et al., 2025; Kennard et al., 2023). However, even after controlling for depressive symptoms, brooding maintained a unique longitudinal effect. This suggests that rumination is not merely an epiphenomenon of depressive severity but represents an independent cognitive vulnerability pathway.

Our findings must also be interpreted within the broader social and contextual landscape of adolescent suicide risk. Social connectedness has been repeatedly identified as

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protective (Arango et al., 2023), and deficits in perceived support are longitudinally associated with suicidal ideation transitions (Nestor et al., 2022). Minority stress processes further exacerbate risk among sexual and gender diverse youth (McArthur, 2026; Racine et al., 2025). Peer victimization mediates associations between minority identity and suicidality (Liu et al., 2025), while online racial discrimination predicts suicidal ideation through traumatic stress pathways (Tynes et al., 2024). These contextual stressors may intensify brooding by reinforcing internalized negative self-appraisals and social defeat cognitions.

Family functioning and parental involvement also shape cognitive vulnerability processes. Parental involvement is inversely associated with suicidal ideation in school-based samples (Long et al., 2021), and family support moderates mental health outcomes in LGBTQ+ youth (DelFerro et al., 2024). Cultural family processes similarly influence depressive symptoms and suicidal ideation longitudinally (Lee et al., 2023). It is plausible that supportive family environments attenuate brooding trajectories, whereas dysfunctional environments may exacerbate them.

Structural and socioeconomic determinants further contextualize our findings. Parental education gradients in youth suicidality (Chen et al., 2022) and regional disparities in remote areas (Kreuze, 2024) highlight macro-level influences on psychological vulnerability. Trauma exposure in pediatric emergency psychiatric populations has been directly associated with suicidality (Marr et al., 2021), and early-life adversity predicts long-term suicidal ideation risk (Orri et al., 2022). Such stress exposures may initiate or reinforce maladaptive rumination patterns, thereby contributing to escalating suicidal ideation.

The pronounced gender effect observed at baseline aligns with research demonstrating elevated suicidality among certain gender-diverse and sexual minority youth (Clark et al., 2022; McArthur, 2026). However, our longitudinal model suggests that brooding exerts its influence across gender categories, indicating a transdiagnostic cognitive mechanism.

5. Conclusion

Digital intervention research offers promising avenues for targeting these mechanisms. Web-assisted behavioral interventions aimed at reducing thwarted belongingness and suicidal ideation have shown preliminary success (Hill et al., 2022). Digital monitoring tools within youth mental health services may allow for real-time assessment of rumination trajectories (Chong et al., 2024). Screening studies emphasize the importance of culturally sensitive and psychometrically valid tools for identifying suicidality across diverse youth populations (Gagnon et al., 2025; Hill et al., 2020). Integrating longitudinal cognitive monitoring into such frameworks may enhance early detection and prevention efforts.

6. Limitations & Suggestions

Several limitations warrant consideration. First, although the longitudinal design strengthens causal inference, observational data preclude definitive conclusions regarding causality. Second, reliance on self-report measures may introduce shared method variance and reporting bias. Third, while the sample comprised high-risk adolescents, findings may not generalize to community or low-risk populations. Fourth, unmeasured contextual variables, including ongoing stress exposure and digital media influences, were not directly modeled. Fifth, although attrition was statistically managed, loss to follow-up may have influenced trajectory estimates.

Future studies should incorporate multi-method assessments, including ecological momentary assessment and behavioral tasks, to capture real-time rumination dynamics. Cross-cultural replications are necessary to determine whether the observed coupling between brooding and suicidal ideation generalizes across sociocultural contexts. Integrating biological markers, such as sleep metrics or genetic risk indicators, may clarify underlying mechanisms. Additionally, testing moderated growth models that incorporate minority stress, trauma exposure, and family functioning variables would provide a more comprehensive developmental framework.

Clinically, the findings underscore the importance of assessing rumination subtypes in suicide risk evaluations. Interventions should specifically target maladaptive brooding through cognitive restructuring, decentering techniques, and emotion regulation training. School-based and digital prevention programs may benefit from integrating modules designed to interrupt perseverative negative thinking cycles. Enhancing family support and social connectedness may further buffer cognitive vulnerabilities. Early identification and targeted intervention for adolescents exhibiting increasing brooding trajectories could play a critical role in mitigating the escalation of suicidal ideation.

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Declaration of Interest

The authors of this article declared no conflict of interest.

Ethical Considerations

The study protocol adhered to the principles outlined in the Helsinki Declaration, which provides guidelines for ethical research involving human participants.

Transparency of Data

In accordance with the principles of transparency and open research, we declare that all data and materials used in this study are available upon request.

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Authors' Contributions

All authors equally contributed to this article.

References

Ai, H., Duan, L., Lin, H., Luo, Y., Alemán, A., & Xu, P. (2023). Dissociated Deficits of Anticipated and Experienced Regret in at-Risk Suicidal Individuals. *Frontiers in Psychiatry*, *14*. https://doi.org/10.3389/fpsyt.2023.1121194

Albrecht, S., Rickwood, D., Telford, N., Privitera, G., & Palfrey, N. (2025). Suicidality in Primary Care, Youth Mental Health Services: Prevalence, Risk Factors and Implications for Practice. *Early Intervention in Psychiatry*, *19*(2). https://doi.org/10.1111/eip.70020

Ang, S. H., Venkateswaran, S., Goda, M. B., Naidu, K. N. C., Kundadak, G. K., & Subramaniam, M. (2025). Prevalence of Suicidal Behaviour in Adolescents and Youth at Ultra-High Risk for Psychosis: A Systematic Review and Meta-Analysis. *European Psychiatry*, *68*(1). https://doi.org/10.1192/j.eurpsy.2025.2444

Arango, A., Brent, D. A., Grupp-Phelan, J., Barney, B. J., Spirito, A., Mroczkowski, M. M., Shenoi, R., Mahabee-Gittens, M., Casper, T. C., & King, C. A. (2023). Social Connectedness and Adolescent Suicide Risk. *Journal of Child Psychology and Psychiatry*, *65*(6), 785-797. https://doi.org/10.1111/jcpp.13908

Arnold, S., Correll, C. U., & Jaite, C. (2023). Frequency and Correlates of Lifetime Suicidal Ideation and Suicide Attempts Among Consecutively Hospitalized Youth With Anorexia Nervosa and Bulimia Nervosa: Results From a Retrospective Chart Review. *Borderline personality disorder and emotion dysregulation*, *10*(1). https://doi.org/10.1186/s40479-023-00216-1

Boylan, K., Duncan, L., Wang, L., Manion, I., Bennett, K., Colman, I., & Georgiades, K. (2025). Prevalence and Correlates of Non-Suicidal Self-Injuring Youth Who Do Not Endorse Suicidal Ideation: Prévalence Et Corrélation De L'automutilation Non Suicidaire Chez Des Jeunes Qui N'ont Pas D'idées Suicidaires. *The Canadian Journal of Psychiatry*, *70*(7), 574-582. https://doi.org/10.1177/07067437251337609

Cai, J. J., Zheng, P., Su, M., Shen, Y., Li, X. C., Guo, Q., Chen, X., Su, G., Lin, J., Gong, R. R., & Fang, D. Z. (2024). Suicidal Ideation in Adolescents With Adiponectin Receptor 2 Rs12342 Polymorphism Affected by Wenchuan Earthquake. *Early Intervention in Psychiatry*, *19*(1). https://doi.org/10.1111/eip.13585

Chang, C. J., Feinstein, B. A., Fulginiti, A., Dyar, C., Selby, E. A., & Goldbach, J. T. (2021). A Longitudinal Examination of the Interpersonal Theory of Suicide for Predicting Suicidal Ideation Among LGBTQ+ Youth Who Utilize Crisis Services: The Moderating Effect of Gender. *Suicide and Life-Threatening Behavior*, *51*(5), 1015-1025. https://doi.org/10.1111/sltb.12787

Chen, P.-J., Mackes, N., Sacchi, C., Lawrence, A. J., Ma, X., Pollard, R., Matter, M., Morgan, C., Harding, S., Schumann, G., Pariante, C. M., Mehta, M. A., Montana, G., Nosarti, C., & Dazzan, P. (2022). Parental Education and Youth Suicidal Behaviours: A Systematic Review and Meta-Analysis. *Epidemiology and Psychiatric Sciences*, *31*. https://doi.org/10.1017/s204579602200004x

Chong, M. K., Hickie, I. B., Ottavio, A., Rogers, D. C., Dimitropoulos, G., LaMonica, H. M., Borgnolo, L. J., McKenna, S., Scott, E., & Iorfino, F. (2024). A Digital Approach for Addressing Suicidal Ideation and Behaviors in Youth Mental Health Services: Observational Study. *Journal of medical Internet research*, *26*, e60879. https://doi.org/10.2196/60879

Clark, K. A., Harvey, T. D., Hughto, J. M. W., & Meyer, I. H. (2022). Mental Health Among Sexual and Gender Minority Youth Incarcerated in Juvenile Corrections. *Pediatrics*, *150*(6). https://doi.org/10.1542/peds.2022-058158

DelFerro, J., Whelihan, J., Min, J., Powell, M., DiFiore, G., Gzesh, A. S., Jelinek, S. K., Schwartz, K. T. G., Davis, M., Jones, J. D., Fiks, A. G., Jenssen, B. P., & Wood, S. (2024). The Role of Family Support in Moderating Mental Health Outcomes for LGBTQ+ Youth in Primary Care. *JAMA Pediatrics*, *178*(9), 914. https://doi.org/10.1001/jamapediatrics.2024.1956

English, D., Kelman, E., Nneka Lundy De La, C., Thompson, A. B., Le, K., Garretson, M., Viswanath, A. L., Brahmbhatt, D., Lockwood, C., Busby, D. R., & Davila, M. (2024). Trends in Suicidality and Bullying Among New York City Adolescents Across Race and Sexual Identity: 2009–2019. *Journal of Urban Health*, *101*(3), 451-463. https://doi.org/10.1007/s11524-024-00860-0

Gagnon, J. C., Quan, J., Daley, M. L., Huggins-Manley, A. C., Houchins, D. E., Lane, H. B., McCray, E. D., & Lambert, R. G. (2025). Convergence, Divergence, and Predictive Validity in Depression and Suicidality Screening Tools With Adjudicated Youth Across Ethnicity. *Behavioral Disorders*, *51*(1), 28-38. https://doi.org/10.1177/01987429251349130

Gmuca, S., Sonagra, M., Xiao, R., Miller, K. S., Gilovich, T., Young, J. F., Weiss, P. F., Sherry, D. D., & Gerber, J. S. (2021). Suicidal Risk and Resilience in Juvenile Fibromyalgia Syndrome: A Cross-Sectional Cohort Study. *Pediatric Rheumatology*, *19*(1). https://doi.org/10.1186/s12969-020-00487-w

JAYPS Adolescent and Youth Psychological Studies
E-ISSN: 2981-2526

Gowin, J. L., Stoddard, J., Doykos, T. K., Sammel, M. D., & Bernert, R. A. (2024). Sleep Disturbance and Subsequent Suicidal Behaviors in Preadolescence. *JAMA Network Open*, *7*(9), e2433734. https://doi.org/10.1001/jamanetworkopen.2024.33734

Hill, K. X., Eck, K. V., Goklish, N., Larzelere-Hinton, F., & Cwik, M. (2020). Factor Structure and Validity of the SIQ-JR in a Southwest American Indian Tribe. *Psychological Services*, *17*(2), 207-216. https://doi.org/10.1037/ser0000298

Hill, R. M., Oosterhoff, B., King, C. A., & Kaplow, J. B. (2022). Open Trial of a Brief, <scp>web-assisted</Scp> Behavioural Intervention to Reduce Thwarted Belongingness and Suicidal Ideation Among Adolescents: The Supporting Grieving Teens Intervention. *Counselling and Psychotherapy Research*, *23*(1), 211-221. https://doi.org/10.1002/capr.12582

Johnson, S. L., Robison, M., Anvar, S., Swerdlow, B. A., & Timpano, K. R. (2022). Emotion-related Impulsivity and Rumination: Unique and Conjoint Effects on Suicidal Ideation, Suicide Attempts, and Nonsuicidal Self-injury Across Two Samples. *Suicide and Life-Threatening Behavior*, *52*(4), 642-654. https://doi.org/10.1111/sltb.12849

Joo, Y. Y., Moon, S. Y., Wang, H. H., Kim, H., Lee, E., Posner, J., Ahn, W. Y., Choi, I., Kim, J.-W., & Cha, J. (2021). Genome-Wide Polygenic Scores for Multiple Psychiatric and Common Traits Identify Preadolescent Youth With Risk for Suicide. https://doi.org/10.21203/rs.3.rs-136949/v2

Kelly, L. M., Meeker, E. C., Zajac, K., Bryan, R., & O'Connor, B. C. (2023). Interactive Effect of Adverse Child Experiences and Suicidal Thoughts and Behaviors on Adolescent Alcohol and Cannabis Use Frequency. *Psychology of Addictive Behaviors*, *37*(8), 1019-1029. https://doi.org/10.1037/adb0000947

Kemp, K., Webb, M., Vieira, A., Pederson, C. A., & Spirito, A. (2021). Do Suicidal Thoughts and Behavior Persist Following Juvenile Justice Involvement? *Suicide and Life-Threatening Behavior*, *51*(6), 1148-1158. https://doi.org/10.1111/sltb.12797

Kennard, B. D., Hughes, J. L., Minhajuddin, A., Slater, H., Blader, J. C., Mayes, T. L., Kirk, C., Wakefield, S., & Trivedi, M. H. (2023). Suicidal Thoughts and Behaviors in Youth Seeking Mental Health Treatment in Texas: Youth Depression and Suicide Network Research Registry. *Suicide and Life-Threatening Behavior*, *53*(5), 748-763. https://doi.org/10.1111/sltb.12980

Kreuze, E. (2024). Mental Health and Suicide Among Youth Residing in Frontier and Remote Areas. *Journal of Clinical Psychology*, *80*(7), 1634-1672. https://doi.org/10.1002/jclp.23684

Lee, C. S., Sin, E. J., Park, M., Okazaki, S., & Choi, Y. (2023). Cultural Family Processes, Depressive Symptoms, and Suicidal Ideation: A Longitudinal Study of Asian American Youths. *Suicide and Life-Threatening Behavior*, *53*(5), 802-817. https://doi.org/10.1111/sltb.12984

Liu, S., English, D., Xiao, Y., Li, Y., & Niu, L. (2025). Sexual and Gender Minority Identity, Peer Victimization, and Suicidality in Adolescents: A mediation Study Using the ABCD Study. *Journal of Child Psychology and Psychiatry*, *66*(10), 1473-1483. https://doi.org/10.1111/jcpp.14155

Lo, B. C. Y., & Cheng, S. K. L. (2024). Emotional Risk Factors, Rumination, and Self-Criticism in Relation to Suicidal Ideation Among Chinese Depressive Outpatients. *Behavioral Sciences*, *14*(11), 1111. https://doi.org/10.3390/bs14111111

Long, K. Q., Yên, N. T., Anh, H. T. N., Park, K., Takeuchi, M., Lam, N. T., Nga, P. T., Anh, L. P., Tuấn, L. V., Bao, T. Q., Van, N. H. N., Thanh, P. Q., Phi, N. H., Anh, L. D. M., Phương, N. H., & Minh, H. V. (2021). Relationships Between Parental Involvement and Suicidal Ideation Among in-School Adolescents in Vietnam: A Multilevel Analysis of the Global School-Based Student Health Survey 2019. https://doi.org/10.1101/2021.03.11.21253432

Marr, M., Gerson, R., Lee, M., Storfer-Isser, A., Horwitz, S. M., & Havens, J. (2021). Trauma Exposure and Suicidality in a Pediatric Emergency Psychiatric Population. *Pediatric Emergency Care*, *38*(2), e719-e723. https://doi.org/10.1097/pec.0000000000002391

McArthur, B. A. (2026). Suicidality and Nonsuicidal Self-Injury in Transgender and Gender Diverse Youth. *JAMA Pediatrics*, *180*(2), 144. https://doi.org/10.1001/jamapediatrics.2025.5274

Nestor, B. A., Liu, Q., Tran, T., & Cole, D. A. (2022). The <scp>cross-sectional</Scp>, Longitudinal, and Transitional Associations Between Perceived Support and Suicidal Ideation and Behavior in Late Adolescence and Emerging Adulthood: Adjacent-category Logit Models. *Suicide and Life-Threatening Behavior*, *52*(5), 908-917. https://doi.org/10.1111/sltb.12888

Orri, M., Ahun, M. N., Naicker, S., Besharati, S., & Richter, L. (2022). Childhood Factors Associated With Suicidal Ideation Among South African Youth: A 28-Year Longitudinal Study of the Birth to Twenty Plus Cohort. *PLOS Medicine*, *19*(3), e1003946. https://doi.org/10.1371/journal.pmed.1003946

Racine, N., Deneault, A. A., Eccles, H., Hopley, A., Le, M., Labelle, P., Prada, K., & Colman, I. (2025). Prevalence of Mental Health and Substance Use Difficulties Among Sexual and Gender Diverse Youth During COVID-19: A Systematic Review and Meta-Analysis. *LGBT Health*, *12*(3), 165-175. https://doi.org/10.1089/lgbt.2023.0263

Renaud-Charest, O., Gold, A. S., Mok, É., Kichler, J., Nakhla, M., & Li, P. (2024). Suicidal Ideation, Suicide Attempts, and Suicide Deaths in Adolescents and Young Adults With Type 1 Diabetes: A Systematic Review and Meta-Analysis. *Diabetes Care*, *47*(7), 1227-1237. https://doi.org/10.2337/dc24-0411

Rosario-Williams, B., Kaur, S., & Miranda, R. (2021). Examining Decentering as a Moderator in the Relation Between Non-suicidal Self-injury and Suicide Ideation via Cognitive–affective Factors. *Suicide and Life-Threatening Behavior*, *51*(4), 741-754. https://doi.org/10.1111/sltb.12747

Tynes, B. M., Maxie-Moreman, A., Hoang, T.-M. H., Willis, H. A., & English, D. (2024). Online Racial Discrimination, Suicidal Ideation, and Traumatic Stress in a National Sample of Black Adolescents. *JAMA Psychiatry*, *81*(3), 312. https://doi.org/10.1001/jamapsychiatry.2023.4961

Wong, S. M. Y., Ip, C. H., Hui, C. L. M., Suen, Y. N., Wong, C. S. M., Chang, W. C., Chan, S. K. W., Lee, E., Lui, S. S. Y., Chan, K. T., Wong, M. T. H., & Chen, E. (2022). Prevalence and Correlates of Suicidal Behaviours in a Representative Epidemiological Youth Sample in Hong Kong: The Significance of Suicide-Related Rumination, Family Functioning, and Ongoing Population-Level Stressors. *Psychological medicine*, *53*(10), 4603-4613. https://doi.org/10.1017/s0033291722001519

Zheng, Y., Wang, J., Jiang, Q., Liao, M., & Huang, F. (2023). Non-Suicidal Self-Injury and Suicidal Ideation Among Adolescents: The Chain-Mediating Role of Rumination and Decentering. *Frontiers in Psychiatry*, *14*. https://doi.org/10.3389/fpsyt.2023.1179518

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