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Childhood Trauma, Alexithymia, and Internalizing Behavior in Female Adolescents: The Mediating Role of Cognitive Fusion

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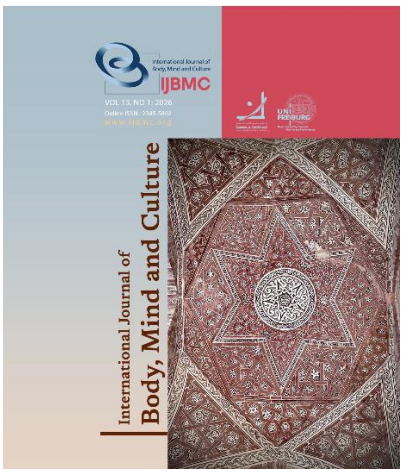

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ABSTRACT

Objective: This study examined the prediction of internalizing behavior problems in female adolescents based on childhood trauma and alexithymia, with cognitive fusion as a mediating variable.

Methods and Materials: This descriptive-correlational study used structural equation modeling. The population included female students in the second cycle of public secondary schools in Karaj, Iran, during the 2025–2026 academic year. A total of 250 students were selected through convenience sampling. Data were collected using a demographic checklist, the Achenbach Internalizing Behavior Questionnaire, the Childhood Trauma Questionnaire, the Toronto Alexithymia Scale, and the Cognitive Fusion Questionnaire. Data were analyzed using Pearson correlation, structural equation modeling, and bootstrap mediation testing in SPSS 29 and AMOS 24.

Findings: Childhood trauma was positively correlated with internalizing behavior problems ($r = 0.518$, $p < 0.012$), as were alexithymia ($r = 0.563$, $p < 0.017$) and cognitive fusion ($r = 0.438$, $p < 0.011$). The model showed acceptable fit: CMIN/DF = 1.95, RMSEA = 0.067, SRMR = 0.04, CFI = 0.92, GFI = 0.93, and TLI = 0.96. Direct effects of childhood trauma ($\beta = 0.52$, $p = 0.011$), alexithymia ($\beta = 0.31$, $p = 0.015$), and cognitive fusion ($\beta = 0.34$, $p = 0.018$) on internalizing behavior problems were significant. Cognitive fusion significantly mediated the effects of childhood trauma ($\beta = 0.46$, $p = 0.002$) and alexithymia ($\beta = 0.35$, $p = 0.001$) on internalizing behavior problems.

Conclusion: Childhood trauma and alexithymia predict internalizing behavior problems in female adolescents, partly through cognitive fusion. Interventions targeting cognitive defusion and emotion identification may help reduce internalizing symptoms.

Keywords: Adolescent, Child Abuse, Alexithymia, Internalizing Problems, Cognitive Behavioral Therapy, Female.

Introduction

Internalizing behaviors in adolescents, including anxiety, depression, loneliness, and withdrawal, are among the main indicators of psychological vulnerability during the transition from childhood to adulthood (Lee et al., 2025; Tecar et al., 2025). At the global level, according to the World Health Organization, approximately 16% to 20% of adolescents aged 10 to 19 experience some form of emotional or mental disorder, which often manifests as internalizing behaviors (Maldonado-Martinez et al., 2025). These patterns are also increasing in Iran; according to the results of the National Adolescent Mental Health Survey, nearly 21% of Iranian adolescents have reported symptoms of mild to severe depression and anxiety (Omidimorad et al., 2023).

Internalizing behaviors in adolescents are often rooted in traumatic experiences or childhood trauma; experiences that directly or indirectly affect the individual's cognitive and emotional patterns (Lee et al., 2025). Psychological studies show that children who are exposed to neglect, family violence, or early emotional deprivation are more likely to experience internalizing mechanisms such as emotional suppression and rumination during adolescence (Coote et al., 2025; Monteleone et al., 2025). This process results from a complex interaction among neurobiological stress systems, insecure attachment, and persistent environmental factors (Alves et al., 2026).

On the other hand, internalizing behaviors in adolescents remain one of the major challenges of global and national mental health, making it necessary to identify modifiable predictors (Tecar et al., 2025). Although the role of childhood trauma is known as a major risk factor, the mechanism through which these injuries are transmitted into psychological problems during adolescence is not yet fully understood (Botchway-Commey et al., 2025). In this regard, alexithymia, which is defined as the inability to identify, describe, and differentiate emotions, emerges as a central impairment in emotion regulation. This cognitive-affective deficit not only weakens the adolescent's ability to process negative experiences constructively but also lays the groundwork for the emergence of internalized symptoms, such as rumination and somatic symptoms, as unprocessed emotion becomes condensed into behavioral form (Riva et al., 2025). Therefore, the present study is based on the assumption that alexithymia is not only an outcome but also a strong predictor, and determining its precise position is essential for designing targeted interventions for this vulnerable group.

Childhood traumatic experiences are considered a major risk factor for internalizing behaviors (Lee et al., 2025). This relationship has been explained directly by the construct of alexithymia, but the cognitive mechanisms underlying this link have received less attention. The present study examines cognitive fusion as a secondary mediator in the proposed model. Cognitive fusion, which refers to a strong attachment to thoughts and a belief in their absolute truth, is considered a central cognitive mediating process in this relationship (Tao et al., 2025). It is assumed that individuals with higher levels of alexithymia are more likely to experience cognitive fusion because they are unable to effectively distance themselves from their mental content (Sanchez-Escamilla et al., 2025). By strengthening rumination and reducing cognitive flexibility, cognitive fusion directly contributes to the formation and persistence of internalizing behaviors. As a result, cognitive fusion is not only a consequence of deficits in emotion regulation but also acts as a cognitive engine that drives the effects of early trauma toward clinical symptoms (Liu et al., 2025; Tao et al., 2025).

The central issue of this study is to fill the existing gap in the causal modeling of these constructs in an adolescent population. Although the direct relationship between trauma and negative psychological outcomes has been established, the precise mechanism through which this injury is transmitted from the level of experience to the level of internalizing behavior requires further exploration. Specifically, this study seeks to test a mediation model in which alexithymia, alongside trauma or as a result of trauma, creates the basis for increased cognitive fusion with negative thought content, and it is this cognitive fusion that, as a cognitive filter, strengthens or explains the predictive power of trauma on internalizing symptoms. Ignoring these cognitive-emotional mediators would lead to therapeutic interventions with limited effectiveness in this vulnerable group.

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The importance of this study lies in its theoretical and practical capacities. From a theoretical perspective, integrating developmental psychopathology models with cognitive mechanisms informed by third-wave therapies provides the necessary coherence to understand vulnerability. It emphasizes the central role of cognitive flexibility in moderating the effects of trauma. From a practical perspective, identifying cognitive fusion as a mediating link paves the way for the design of targeted interventions. Instead of focusing solely on reducing emotions themselves, which is difficult in alexithymia, defusion techniques can be applied early in rehabilitation programs for adolescents with a history of trauma in order to prevent negative thoughts from turning into harmful behaviors.

Despite numerous studies across separate fields, this study aims to address three major shortcomings in the research literature. First, there is a lack of structural models that simultaneously evaluate the direct and indirect effects of the above variables in adolescent populations. Second, although alexithymia has often been considered a risk factor, the role of cognitive fusion as a second-stage mediator in the transmission of the effect of trauma to behavioral outcomes has not been systematically explored. Third, most studies have focused on adult populations or established clinical populations. In contrast, this study focuses on adolescents, offering an opportunity for preventive intervention during a period when psychological structures are still being consolidated. Therefore, the present study was conducted to predict internalizing behavior in adolescents based on childhood trauma and alexithymia with the mediating role of cognitive fusion.

Methods and Materials

Study Design

In terms of objective, this study is applied; in terms of implementation approach, it is descriptive-correlational; and in terms of data type, it is quantitative, using structural equation modeling. The statistical population consisted of all female adolescents studying in the second cycle of secondary education in public schools in Karaj during the 2025–2026 academic year. To determine the sample size, the rule proposed by (Kline, 2023) was used. Kline states that in path analysis and structural equation modeling, 10 or 20 participants are required for each variable; however, a minimum sample size of 200 participants is defensible. Therefore, from the mentioned population, 250 individuals who met the inclusion criteria were selected as the sample using convenience sampling.

The inclusion criteria included being female and studying in the second cycle of secondary education, continuous residence in Karaj at the time of the study, obtaining a score higher than the determined clinical cutoff on the trauma assessment scale, complete responses to all questions of the self-report instruments, and provision of informed consent by both the participants and their parents/legal guardians, due to the vulnerable nature of the age group. In contrast, the exclusion criteria included a history of formal diagnosis of psychotic disorders, such as schizophrenia, or major disorders in cognitive functioning; any ongoing abuse of psychotropic drugs or narcotic substances that could affect emotion regulation; incomplete completion of the questionnaires or provision of meaningless responses; and a history of running away from school or home.

The study was conducted as follows: after obtaining the necessary ethical approvals from the research committee, coordination was established with the Department of Education and subsequently with the principals of public girls' secondary schools in Karaj. The first phase included providing comprehensive explanations of the study's nature, ensuring data confidentiality, and obtaining written informed consent. The second phase was devoted to distributing the complete set of measurement instruments, including standardized scales for trauma, alexithymia, cognitive fusion, and internalizing behaviors, as a self-administered package. The data were collected confidentially and, after qualitative verification, entered into the statistical database.

It should be noted that, in this study, the ethical principles of research were observed in accordance with the Declaration of Helsinki, including informed consent and willingness of individuals to participate in the study, absence of any coercion, absence of any physical, psychological, or financial harm to the sample members, confidentiality of the information of participants, use of research instruments without requiring the registration of names or personal information, analysis of the results in group form and publication in the form of an article, no cost imposed on sample members for participation in

the study, and responsibility of the researcher for all related costs.

Instruments

Internalizing Behavior Questionnaire: This self-report instrument, developed by Achenbach (1992), comprises 112 items across two sections: competence and syndrome. The syndrome section includes internalizing problems and externalizing problems. The items are scored from "not true," with a score of 0, to "very true," with a score of 2. The developer of the instrument reported Cronbach's alpha coefficients of 0.86 for the total questionnaire and 0.95 for total behavioral problems, and internal consistency coefficients of 0.89 and 0.86, respectively (Lansford et al., 2025). In the study by Sobhani et al. (2021), the Cronbach's alpha coefficient for internalizing problems was 0.74.

Childhood Trauma Experience Questionnaire: This self-report instrument was developed and validated by Bernstein et al. (2003). It contains 28 items and 5 subscales, including emotional abuse, physical abuse, sexual abuse, emotional neglect, and physical neglect. The items are scored on a 5-point Likert scale, ranging from "never happened to me," with a score of 1, to "happened to me most of the time," with a score of 5. Items 3, 5, 6, 7, 14, 15, 18, and 25 are reverse-scored. A high score on this questionnaire indicates childhood traumatic experiences. The developers of the questionnaire confirmed its construct validity, five-factor structure (RMSEA = 0.06), and discriminant validity, including significant differentiation between normal and clinical individuals, in the original version. Its reliability, as reported by Cronbach's alpha, ranged from 0.73 to 0.92 among normal individuals. In addition, its concurrent validity with therapists' ratings of childhood traumatic events was reported between 0.59 and 0.78. This instrument was translated and validated in Iran by Ebrahimi et al. (2022). In their study, the overall content validity index of the questionnaire was 0.84, and the content validity was 0.80, indicating appropriate validity. In addition, the reliability of the questionnaire using Cronbach's alpha coefficient was calculated in the range of 0.81 to 0.98, and its test-retest reliability was calculated as 0.94 (Shahamat & Heidarhosein, 2024).

Alexithymia Questionnaire: This self-report instrument was developed by Bagby et al. (1994) and includes 20 items with 3 components: difficulty identifying feelings, difficulty describing feelings, and externally oriented thinking. This instrument is scored on a 5-point Likert scale, ranging from "strongly disagree," with a score of 1, to "strongly agree," with a score of 5. The developers of the instrument reported Cronbach's alpha coefficients for the total instrument and its subscales ranging from 0.42 to 0.85. In the study by Bagheri et al. (2020), the reliability of this instrument was calculated using Cronbach's alpha, which was 0.71.

Cognitive Fusion Questionnaire: This self-report instrument was developed by Gillanders et al. (2014) and includes 12 items. This instrument is scored on a 6-point Likert scale, ranging from "never" (score 1) to "always" (score 5). The instrument's developers reported a Cronbach's alpha of 0.81 for the total instrument. In the study by Ezatizadeh et al. (2023), the reliability of this instrument was calculated using Cronbach's alpha, which was 0.84.

In this study, various descriptive statistics (frequencies, percentages, means, and standard deviations), the statistical assumptions of structural equation modeling, and correlation coefficients were used to analyze the data. The analyses were conducted using SPSS version 29 and AMOS version 24.

Findings and Results

The results showed that the mean and standard deviation of age, in years, among the sample participants were 17.86 years and 5.34, respectively. Moreover, the demographic information showed that 36% of the participants (88 individuals) were in the tenth grade, 51% (127 individuals) were in the eleventh grade, and 14% (35 individuals) were in the twelfth grade. In terms of fathers' occupation, 73%, 183 individuals, reported that their father's job was self-employed or non-governmental, and 27%, 67 individuals, reported that their father's job was governmental. Table 1 presents the descriptive statistics of the research variables.

Table 1

Mean and standard deviation of the research variables among female adolescents

Research Variable	Number	Mean	Standard Deviation	Skewness	Kurtosis

Emotional abuse	250	14.11	3.07	-0.218	0.786
Physical abuse	250	9.04	1.19	1.609	1.235
Sexual abuse	250	10.18	2.03	-1.156	1.242
Emotional neglect	250	13.15	2.10	-0.463	0.877
Physical neglect	250	14.03	2.09	-0.866	0.658
Childhood trauma	250	60.51	10.48	-1.414	0.434
Difficulty identifying feelings	250	18.13	1.24	-0.756	0.228
Difficulty describing feelings	250	23.49	4.14	-1.298	1.513
Externally oriented thinking	250	21.05	2.11	-1.087	1.905
Alexithymia	250	62.67	7.49	-1.542	0.407
Cognitive fusion	250	32.58	5.08	-0.864	1.337
Internalizing behavior problems	250	41.16	6.73	-1.338	1.654

Considering the aim of the present study, which was to develop a model, and since modeling requires meeting its assumptions, skewness and kurtosis were used to assess univariate normality of the data. Mardia's index and critical ratio were used to assess multivariate normality. Since the obtained values for Mardia's coefficient and the critical ratio should be less than 5, and in this study, Mardia's coefficient was 2.65, and the critical ratio was 1.36, the results indicated multivariate normality of the score distribution. Based on the results of Table 1, the skewness and kurtosis values of the research variables were also within the range of -2 to +2. Therefore, the distribution of all research variables was normal. Another assumption of structural equation modeling is the independence of errors. Accordingly, if the Durbin–Watson statistic is between 1.5 and 2.5, the independence of errors can be accepted. Since the Durbin–Watson statistics in this study were calculated to be between 1.5 and 2.5, the errors are approximately independent.

The assumption of multicollinearity was also examined, and the results showed that none of the tolerance values was below the permissible limit of 0.1. None of the variance inflation factor values was above the permissible limit of 10. Therefore, there was no multicollinearity. On the other hand, the presence of outliers and extreme data points can create several problems in data analysis, one of which is the violation of the assumption of normality of the variables. An outlier, especially an extreme data point, is a value that, contrary to the general trend of the data, is extremely small or large and disrupts the normal distribution of the data. Such data may, for example, yield a mean that is inconsistent with the average performance of most of the data (Kline, 2023). To examine outliers in the present study, the Explore command in SPSS was used. The examination of outliers in the research variables showed no outliers. Table 2 presents the Pearson correlation coefficients among the research variables.

Table 2

Pearson correlation coefficients among female adolescents

Research Variable	1	2	3	4	5	6	7	8	9	10	11	12
1. Emotional abuse	1											
2. Physical abuse	0.344**	1										
3. Sexual abuse	0.308**	0.281**	1									
4. Emotional neglect	0.229**	0.519**	0.406**	1								
5. Physical neglect	0.212**	0.198**	0.186**	0.176**	1							
6. Childhood trauma	0.541**	0.553**	0.318**	0.423**	0.223**	1						
7. Difficulty identifying feelings	0.172**	0.221**	0.510**	0.222**	0.139**	0.291**	1					
8. Difficulty describing feelings	0.311**	0.159**	0.196**	0.119**	0.174**	0.154**	0.333**	1				
9. Externally oriented thinking	0.201**	0.163**	0.151**	0.143**	0.149**	0.123**	0.216**	0.189**	1			
10. Alexithymia	0.501**	0.492**	0.336**	0.555**	0.386**	0.459**	0.444**	0.270**	0.666**	1		
11. Cognitive fusion	0.412**	0.318**	0.292**	0.765**	0.255**	0.376**	0.343**	0.504**	0.224**	0.713**	1	
12. Internalizing behavior problems	0.333**	0.287**	0.514**	0.490**	0.211**	0.518**	0.310**	0.251**	0.177**	0.563**	0.438**	1

According to the results of Table 2, there was a positive and significant correlation at the 0.05 level between the total score of childhood trauma ($r = 0.518$, $p < 0.012$) and each of its dimensions, including emotional abuse ($r = 0.333$, $p < 0.024$), physical abuse ($r = 0.287$, $p < 0.010$), sexual abuse ($r = 0.514$, $p < 0.017$), emotional

neglect (r = 0.490, p < 0.013), and physical neglect (r = 0.211, p < 0.022), with the experience of internalizing behavior problems among female adolescents. Moreover, the results of this table showed that there was a positive and significant correlation at the 0.05 level between the total score of alexithymia (r = 0.563, p < 0.017) and each of its dimensions, including difficulty identifying feelings (r = 0.310, p < 0.025), difficulty describing feelings (r = 0.251, p < 0.015), and externally oriented thinking (r = 0.177, p < 0.034), with the experience of internalizing behavior problems among female adolescents. This relationship was also positive and significant at the 0.05 level between the total score of cognitive fusion (r = 0.438, p < 0.011) and the experience of internalizing behavior problems among female adolescents. Table 3 presents the goodness-of-fit indices of the research model.

Table 3

Goodness-of-fit indices of the fitted research model

Type of Index	Indices	Obtained Value	Acceptable Value
Absolute indices	Normed chi-square (CMIN)	175.32	-
	Degree of freedom	90	
	CMIN/DF	1.95	Less than 3
	Significance level	0.001	-
Relative indices	Root mean square error of approximation (RMSEA)	0.067	Less than 0.08
	Standardized root mean square residual (SRMR)	0.04	Less than 0.08
	Parsimony close fit index (PCLOSE)	0.001	Less than 0.05
	Comparative fit index (CFI)	0.92	Greater than 0.90
	Adjusted goodness-of-fit index (AGFI)	0.94	Greater than 0.90
	Parsimony comparative fit index (PCFI)	0.69	Greater than 0.60
	Parsimony normed fit index (PNFI)	0.89	Greater than 0.60
	Incremental fit index (IFI)	0.94	Greater than 0.90
	Tucker–Lewis index (TLI)	0.96	Greater than 0.90
	Goodness-of-fit index (GFI)	0.93	Greater than 0.90
	Normed fit index (NFI)	0.92	Greater than 0.90

In this study, the parameter estimation method was maximum likelihood estimation (MLE). Based on the results, all fit indices were desirable, and the root mean square error of approximation (RMSEA) should be below 0.08. Moreover, the standardized root mean square residual (SRMR) is defined as the difference between the observed correlation and the model-implied correlation matrix. This index enables the evaluation of the average magnitude of differences between observed and expected correlations as an absolute criterion of model fit. If the SRMR value is less than 0.08 Kline (2023), or according to other sources, including Aldhmadi et al. (2025), values of SRMR ≤ 0.05 indicate a good fit, and values ≤ 0.10 indicate an acceptable fit. According to the results in Table 3, the RMSEA was 0.067, and the SRMR was 0.04. Therefore, it can be concluded that the model had a very good and appropriate fit with the data. In addition, the 95% confidence interval for the RMSEA ranged from 0.046 to 0.057, indicating a desirable fit of the model. Table 4 presents the standardized and direct coefficients.

Table 4

Direct and standardized coefficients of the research model

Direct Paths	Standardized Coefficient	Unstandardized Coefficients			
	Beta coefficient	b coefficient	Standard Error	T	Significance Level

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Childhood trauma → Internalizing behavior problems	0.52	0.28	0.17	2.35	0.011
Alexithymia → Internalizing behavior problems	0.31	0.17	0.09	1.04	0.015
Cognitive fusion → Internalizing behavior problems	0.34	0.23	0.06	4.15	0.018

Table 5

Bootstrap results of the research model for examining mediating paths

Indirect Path	Standardized Indirect Effect	Confidence Interval		Significance Level
		Lower Limit	Upper Limit	
Childhood trauma → Cognitive fusion → Internalizing behavior problems	0.46	0.27	0.70	0.002
Alexithymia → Cognitive fusion → Internalizing behavior problems	0.35	0.33	0.53	0.001

Based on what is presented in Table 4, the paths from childhood trauma to internalizing behavior problems (β = 0.52, p < 0.011), alexithymia to internalizing behavior problems (β = 0.31, p < 0.015), and cognitive fusion to internalizing behavior problems (β = 0.34, p < 0.018) were significant. Table 5 presents the bootstrap results for childhood trauma and alexithymia on internalizing behavior problems. To test the significance of the mediating effect of cognitive fusion in the relationship between internalizing behavior problems and childhood trauma and alexithymia among female adolescents, the bootstrap method with 2,000 resamples at a 95% confidence interval was used. The greater the number of resamples, the higher the predictive accuracy.

Furthermore, according to Kline (2023), if the lower and upper estimates do not pass through zero, the indirect effect is considered significant. Table 5 presents the bootstrap results. In this method, if both the lower and upper limits of this test are positive or negative, and zero does not fall between them, the indirect causal path is significant. According to the results of Table 5, this rule applies to the effect of childhood trauma on internalizing behavior problems among female adolescents through the mediating role of cognitive fusion. Also, according to the results in Table 5, this rule applies to the effect of alexithymia on internalizing behavior problems among female adolescents, mediated by cognitive fusion.

Discussion and Conclusion

This study was conducted to predict internalizing behavior in adolescents based on childhood trauma and alexithymia, with the mediating role of cognitive fusion. The first finding of the study showed that the direct effect of childhood trauma on internalizing behavioral problems in female adolescents was positive and significant. This result of the present study is consistent with those of some previous studies, such as Coote et al. (2025), Hamidinejad et al. (2023), Lee et al. (2025), Maldonado-Martinez et al. (2025), Monteleone et al. (2025), and Torkaman et al. (2023).

To deepen the scientific explanation of the relationship between childhood trauma and the emergence of internalizing behavioral problems during adolescence, it is necessary to enter the level of developmental neurobiology and epigenetics. Complex childhood trauma, as a chronic stressor, not only causes allostatic dysregulation of the HPA axis but also alters the expression patterns of stress-response genes through epigenetic mechanisms, particularly DNA methylation at the promoters of glucocorticoid receptors in the hippocampus. These epigenetic changes reduce the individual's ability to turn off the inflammatory and stress responses, resulting in a hyperreactive phenotype to later stressors during adolescence. From the perspective of cognitive-social psychology, this early chaotic environment stabilizes an insecure attachment pattern, which, in turn, functions as an early maladaptive schema in cognitive models such as Young's model. These schemas lead to cognitive biases that reinforce catastrophic appraisals of everyday events. As a result, instead of seeking external support, which is not properly formed in insecure attachment patterns, the adolescent devotes resources to internal processing and cognitive avoidance of unpleasant emotions, which are precisely the mechanisms that directly lead to the clinical

manifestations of anxiety, social avoidance, and depression.

Another finding of the study showed that the direct effect of alexithymia on internalizing behavioral problems in female adolescents was positive and significant. This result is consistent with findings from previous researchers, including Bains & Fite (2025), Li et al. (2026), and Mancini et al. (2025). This relationship can be explained by focusing on information-processing models and cognitive emotion regulation. Alexithymia is a multidimensional construct that includes difficulty identifying and expressing emotions and directly affects cognitive emotion regulation. From the perspective of cognitive neuroscience, individuals with alexithymia often exhibit weaker connectivity between the ventromedial prefrontal cortex (vmPFC), which plays a role in emotional appraisal and valuation, and the amygdala, the primary center for processing fear and threat. This deficit in the brain circuit leads to an inability to engage in cognitive reappraisal; that is, the individual cannot effectively reinterpret stressful stimuli and reduce the intensity of the emotional response. As a result, unprocessed or "unlabeled" emotion remains as inhibited psychological energy, which, according to stress reactivity theory, increasingly keeps the body's autonomic systems activated. This chronic activation of internal systems, such as the sympathetic nervous system, manifests itself in the form of internalizing symptoms because energy is spent on the continuous suppression and inhibition of emotional responses, and ultimately leads to an inability to experience happiness and an increase in the levels of anxiety and clinical depression.

The outcome of the study showed that internalizing behavior problems in adolescents can be predicted based on childhood trauma and alexithymia, with the mediating role of cognitive fusion in female adolescents. No finding inconsistent with the result of the present study was observed; however, in general, this result is consistent with the findings of some previous studies, such as Coote et al. (2025), Maldonado-Martinez et al. (2025), Torkaman et al. (2023), Mancini et al. (2025), Li et al. (2026), Bains & Fite (2025), and Neumann et al. (2025).

Childhood traumatic experiences, especially chronic and complex traumas, severely weaken the adolescent's neurobiological capacity for effective emotion regulation by creating persistent dysregulation in the HPA axis and inducing structural and functional changes in key brain regions such as the hippocampus and amygdala. This neurobiological dysregulation, which is accompanied by maladaptive allostasis, manifests as reduced cognitive flexibility and an inability to use adaptive emotion-regulation strategies, including cognitive reappraisal. At the same time, alexithymia acts as an aggravating factor and, by making the identification and expression of emotions difficult, prevents the healthy processing and release of trauma-related tensions. This directs emotional processing toward maladaptive mechanisms such as rumination.

In this context, cognitive fusion acts as a key mediating mechanism. Trauma and alexithymia together contribute to the creation and strengthening of the individual's tendency to "become fused" with negative and distorted thoughts. In other words, cognitive fusion causes thoughts related to trauma and the unpleasant emotions arising from it to be regarded not as mental events, but as absolute truths. This fusion further reduces cognitive flexibility and leads to the penetration of negative thoughts into all levels of psychological-behavioral functioning. As a result, this condition directly predicts the emergence of internalizing behaviors such as generalized anxiety and major depression, because instead of distancing themselves from intrusive thoughts and accepting unpleasant emotions, adolescents become immersed in them and avoid any constructive action or search for coping strategies, which in turn intensifies the vicious cycle.

Considering the correlational nature of the design and the limitations of the sample group, the study's limitations mainly fall into two fundamental aspects. First, the cross-sectional nature of the study, although it enables examination of reciprocal relationships, limits the ability to draw definitive inferences about the causal direction among constructs and, in particular, the certainty of trauma's causal role in subsequent variables over time. Second, the complete reliance on participants' self-reports to measure constructs such as trauma and cognitive fusion may be susceptible to response biases, including social desirability and memory errors. Based on these limitations, future research should focus on implementing a longitudinal design to track the effects of trauma and mediating mechanisms over time. It should consider using multimethod approaches, such as structured clinical interviews or physiological data, to

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validate self-report findings. It is also recommended that future studies exercise greater caution when generalizing the results to nonclinical populations or male samples.

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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 Declaration of Helsinki, which provides guidelines for ethical research involving human participants. Ethical considerations in this study were that participation was entirely optional.

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 contribute to this study.

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