PRACTICE in CLINICAL PSYCHOLOGY

July 2025, Volume 13, Number 3

Research Paper

# Developing a Self-harm Model Based on Cognitive Emotion Regulation and Childhood Trauma With the Mediating Role of Insecure Attachment Styles in Students of Ardabil City, Iran: A Descriptive Study

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**Citation** Noroozi Homayoon, M., Ghohari, F., & Sadri Damirchi, E. (2025). Developing a Self-harm Model Based on Cognitive Emotion Regulation and Childhood Trauma With the Mediating Role of Insecure Attachment Styles in Students of Ardabil City, Iran: A Descriptive Study. *Journal of Practice in Clinical Psychology, 13*(3), 239-252. https://doi.org/10.32598/jpcp.13.3.1049.1

**https://doi.org/10.32598/jpcp.13.3.1049.1**

**Article info:**
**Received:** 05 Jan 2025
**Accepted:** 25 May 2025
**Available Online:** 01 Jul 2025

**Keywords:**
Self-harm, Cognitive emotion regulation, Trauma, Attachment styles, Students

## ABSTRACT

**Objective:** This study aimed to develop a structural model explaining self-harm based on cognitive emotion regulation and childhood trauma, with the mediating role of attachment styles among students in Ardabil City, Iran.

**Methods:** This applied study, in terms of its objective, employed a descriptive-correlational research design, utilizing structural equation modeling. The exogenous variables were cognitive emotion regulation and childhood trauma, while self-harm served as the endogenous variable, with insecure attachment styles functioning as the mediating variable. The statistical population consisted of secondary school students aged 15 to 18 residing in Ardabil during the fall semester of the 2024 academic year. The research instruments included the self-harm inventory (SHI), cognitive emotion regulation questionnaire, childhood trauma questionnaire (CTQ), and attachment styles scales (ASS).

**Results:** The results indicated that insecure attachment styles had a significant positive effect on self-harm ($\beta$=0.534; P<0.01). Also, cognitive emotion regulation exerted a significant negative effect on self-harm ($\beta$=-0.488; P<0.001), whereas childhood trauma had a significant positive effect on self-harm ($\beta$=0.462; P<0.001). Additionally, cognitive emotion regulation ($\beta$=0.277; P<0.05) and childhood trauma ($\beta$=0.233; P<0.05) had a significant indirect effect on self-harm through the mediation of insecure attachment styles.

**Conclusion:** The findings suggest that childhood trauma and deficiencies in cognitive emotion regulation affect self-harm among students with insecure attachment styles, playing a mediating role. These results highlight the importance of cognitive-emotional mechanisms and attachment experiences in both the prevention and better understanding of self-harm behaviors.

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## Highlights

- Childhood trauma significantly predicts self-harm in students with insecure attachment styles.
- Cognitive emotion regulation difficulties are associated with increased risk of self-harming behaviors.
- Insecure attachment styles mediate the relationship between childhood trauma and self-harm.

## Plain Language Summary

This study explores why some high school students may engage in self-harming behaviors and what psychological factors contribute to it. Researchers focused on three main issues: how young people regulate their emotions, whether they have experienced trauma during childhood, and the kind of emotional bonds (attachment styles) they formed with their caregivers. The study was conducted with 335 students aged 15 to 18 in Ardabil, Iran. They answered questionnaires measuring their history of self-harm, how they manage emotions, whether they experienced abuse or neglect as children, and their attachment style (secure or insecure). The findings showed that students who had difficulty regulating their emotions, especially those who used negative strategies like self-blame or rumination, were more likely to self-harm. Likewise, those who had experienced childhood trauma—such as emotional, physical, or sexual abuse—also had a higher tendency to harm themselves. One important discovery was the role of insecure attachment styles. Students who had insecure bonds with their caregivers (such as anxious or avoidant styles) were more vulnerable to emotional difficulties and more likely to engage in self-harm. These attachment styles also explained part of the connection between childhood trauma and self-harm, and between emotion regulation problems and self-harm. The study suggests that improving emotional regulation skills and promoting healthy, secure relationships in early life can help reduce self-harming behaviors in adolescents. It also emphasizes the need for mental health programs in schools that address these issues early on.

## Introduction

Self-harm is defined as a deliberate, repetitive, and maladaptive behavior wherein people inflict pain or injury upon their body tissue without the intention of suicide (Elserafi et al., 2024; Noroozi Homayoon et al., 2023). This phenomenon exhibits a notable prevalence within the student population, with studies indicating a rate between 10% and 30%, although cultural, social, and methodological differences contribute to variability in these estimates (Ramazani et al., 2025). In Iran, recent studies have revealed a rising incidence of self-harm among students and youth, which has become a significant concern within the domain of mental health (McEvoy et al., 2024). From a psychological perspective, the emotion regulation model views self-harm as a maladaptive strategy employed to reduce emotional arousal and intolerable emotional distress (Kpeno et al., 2024). The theory of negative feedback also posits that this behavior is reinforced through the temporary reduction of negative emotions. Neurocognitive evidence suggests that self-harming behaviors are associated with deficits in emotional regulation circuits, particularly involving reduced prefrontal cortex activity in inhibiting impulsivity and modulating amygdalar responses to stress (Santana-Gonzalez et al., 2025). Furthermore, the interactionist model of self-harm and pain processing indicates that individuals who engage in self-harm exhibit neurophysiological changes in the perception and processing of both physical and emotional pain, which may contribute to the persistence of this behavior (Wen et al., 2025). Longitudinal studies have demonstrated that self-harm is closely associated with disrupted cognitive-emotional patterns, such as negative rumination and emotional alexithymia, which may serve as precursors for more severe psychological disorders in the future (Tyler, 2023).

One of the variables presumed to be related to self-harm in the present study is cognitive emotion regulation. Cognitive emotion regulation refers to the cognitive processes an individual uses to modify, manage, and alter their emotional experience, playing a crucial role in mental health and adaptive behaviors (Noroozi Homayoon et al., 2024a; Noroozi Homayoon et al., 2024b). According to Garnefski and Kraaij's model, cognitive emotion regulation encompasses adaptive strategies (such

as positive reappraisal, acceptance, and refocusing) and maladaptive strategies (such as rumination, self-blame, and catastrophizing) (Noroozi Homayoon et al., 2024a). Evidence suggests that in individuals who engage in self-harming behaviors, maladaptive strategies — particularly rumination and self-blame — act as mediators in exacerbating emotional arousal and increasing the inability to regulate emotions (Labella et al., 2024). From a neuropsychological perspective, diminished prefrontal cortex functioning in cognitive regulation, along with heightened amygdala reactivity, leads to biased processing of negative information and an escalation of emotional distress, ultimately prompting the individual to use self-harm as an emotional release mechanism (Hatami Nejad et al., 2024; Noroozi Homayoon et al., 2023). The pain-emotion interaction theory also posits that an inability to utilize adaptive cognitive strategies heightens emotional pain sensitivity, prompting the individual to alter their emotional threshold through physical harm as a way to regulate emotional distress temporarily (Brzozowski & Crossey, 2024). Consequently, deficits in cognitive emotion regulation not only facilitate but also represent a fundamental mechanism in the persistence and continuation of self-harm (Noroozi Homayoon et al., 2023; Wang et al., 2024). Research has also demonstrated a significant and negative relationship between cognitive emotion regulation and self-harm. For instance, Putri and Hariyono (2023) showed that higher emotion regulation was associated with a lower tendency for self-harm among university students. Carvalho et al. (2023) also found that emotion regulation would protect against self-harming behaviors in adolescents. Furthermore, Natividad et al. (2024) showed that emotion dysregulation was associated with self-harm in individuals with borderline personality disorder. Warne et al. (2023) also highlighted the connection between emotion regulation deficits and self-harm.

Another variable seemingly related to self-harm is childhood trauma. In his psychoanalytic theory, Freud considered early childhood experiences as determinant factors in forming personality and psychological harm, believing that unresolved conflicts during childhood can manifest as neurotic symptoms in adulthood (Nejad et al., 2025). Accordingly, childhood trauma refers to negative and stressful experiences that occur during critical developmental stages, including physical, emotional, and sexual abuse, parental neglect, and dysfunctional family environments (Carvalho, 2024). From a neurobiological perspective, prolonged exposure to severe stress during childhood can result in dysfunction in the hypothalamic-pituitary-adrenal axis, increased amygdala activity, and reduced prefrontal cortex functioning in cognitive emotion regulation (Allendorfer et al., 2024; Dogra et al., 2024; Wang et al., 2024). These changes render individuals with a history of childhood trauma more sensitive to emotional threats and prone to deficits in processing emotional experiences (Hadar, 2024). The sensitivity-stress theory argues that early exposure to chronic stress lowers emotional tolerance thresholds and increases vulnerability to emotional regulation difficulties (Lembke et al., 2024). A strong association has been observed between childhood trauma and self-harming behaviors, as many individuals who engage in self-harm report a history of traumatic experiences (Erol & Inozu, 2024). Self-harm, in this context, functions as a mechanism for compensating for deficits in emotion regulation caused by early stressful experiences, particularly by temporarily reducing emotional arousal or numbing, which is commonly observed in individuals with a history of severe trauma (Bahali et al., 2024; van Schie et al., 2024). Research also reveals a positive and significant relationship between childhood trauma and self-harm. For example, Shi et al. (2024) demonstrated that childhood trauma was a crucial factor in adolescent self-harm. Liu et al. (2024) also showed that childhood trauma was a significant predictor of self-harm in individuals. Additionally, other studies have found a significant and positive correlation between childhood trauma and self-harm (Choi & Song, 2024; Fu et al., 2024; Lin, 2024; Liu et al., 2024; van Schie et al., 2024; Wang, 2024; Yang et al., 2024).

Another variable that may mediate the relationship between self-harm and other factors is insecure attachment styles. Bowlby's attachment theory posits that early bonds between children and caregivers play a crucial role in shaping behavioral and emotional patterns throughout life (Nejad et al., 2025). Insecure attachment forms when early interactions with caregivers are inconsistent, contradictory, or unstable, resulting in difficulties with emotional regulation and interpersonal relationships (Wu, 2024). The three primary insecure attachment styles are avoidant, anxious (also known as ambivalent), and disorganized (Nejad et al., 2025). In the avoidant style, the child develops excessive emotional independence and avoids dependence due to unresponsiveness from the caregiver; in the anxious style, the individual experiences excessive dependency and a fear of abandonment (Ginalska & Cichopek, 2024; Schmalbach et al., 2024; Umucu et al., 2025); and in the disorganized style, often observed in children with traumatic experiences, the individual oscillates between the need for closeness and fear of the caregiver (Christie & Sandoval, 2024). From a neurobiological perspective, insecure attachment is associated with increased amygdala activity and impaired prefrontal cortex functioning, resulting

in difficulties with emotional regulation (Laufer et al., 2024; Mizrahi et al., 2024). In this context, self-harming behavior serves as a maladaptive mechanism for emotion regulation in individuals with insecure attachment, especially anxious and disorganized styles. Those with anxious attachment may use self-harm as a means to gain attention or regulate emotional arousal.

At the same time, in the disorganized style, this behavior often arises from internal conflict and cognitive-emotional disarray that impairs emotional tension management. Therefore, insecure attachment acts as a predisposing factor in the formation and continuation of self-harm, particularly through shortfalls in cognitive emotion regulation and heightened sensitivity to interpersonal stress (Samaey et al., 2024). Research also indicates a positive and significant relationship between insecure attachment and self-harm, both directly and indirectly through the mediating roles of cognitive emotion regulation and childhood trauma. For example, Bai (2024) found that insecure attachment is significantly related to emotional disorders, highlighting emotion regulation as a key mediator across the lifespan. Additionally Finch et al. (2024), Gong and Zhang (2024), Lucherini Angeletti et al. (2024), Silva Filho et al. (2023), Wang et al. (2024), and Zhanga and Li (2024) demonstrated that insecure attachment was positively correlated with childhood trauma and cognitive emotion regulation, which, in turn, was related to self-harm. Considering that self-harm is a serious psychological issue among students, particularly in communities with high environmental and social stress, an in-depth investigation into the underlying cognitive and emotional mechanisms is neccessary. Ardabil, due to its specific cultural, social, and economic characteristics, including high levels of academic pressure, familial problems, and limitations in psychological service provision, presents a fertile ground for the emergence of maladaptive behaviors, such as self-harm. Given that cognitive emotion regulation and childhood trauma are key factors in the formation of this behavior, exploring the role of attachment styles as a mediating variable could further elucidate the underlying mechanisms of this phenomenon. Studies have shown that students with insecure attachment styles, compared to their peers, tend to employ more maladaptive strategies for emotion regulation, which, when combined with childhood trauma, increases the likelihood of self-harm. Limited research has simultaneously examined these variables in the student population in Iran, especially in Ardabil City. Developing a structural model based on these variables not only contributes to the advancement of domestic knowledge regarding psychological pathology but also provides a foundation for designing preventive interventions and promoting the mental health of students.

## Materials and Methods

This study is applied in terms of its objective, which is descriptive and correlational, relying on structural equation modeling. The exogenous variables in this study are emotional regulation and childhood trauma, with self-harm as the endogenous variable, and insecure attachment styles as the mediating variable. The statistical population includes secondary school students aged 15 to 18 residing in Ardabil City, Iran, during the fall semester of the 2023-2024 academic year. The sample size was selected using a convenience sampling method, with 350 participants chosen. The inclusion criteria included the participants' willingness to participate, the absence of psychological problems, and an age range of 15 to 18 years. The exclusion criteria were unwillingness to participate, failure to complete the questionnaires, and providing random answers to the questions. When the maximum number of independent variables in the measurement and structural models is three, 124 observations are needed to achieve 80% statistical power and a minimum $R^2$ value of 0.10 (with a 5% error rate). Given that a higher sample size increases the accuracy (consistency) of partial least squares estimates (Hair et al., 1995), and to obtain more generalizable results and minimize statistical error, the sample size in this study was set to 350, considering the possibility of sample attrition. Ultimately, 335 questionnaires were included in the statistical analysis.

### Study instruments

Self-harm inventory (SHI) is a 22-item questionnaire, developed by Sansone et al. (1998). It assesses the history of self-harm behaviors and is answered in a yes/no format. A score of 1 is assigned for "yes" and 0 for "no." The total score is derived by summing the "yes" responses. The questionnaire assesses behaviors such as substance abuse, alcohol use, self-injury, and physical harm inflicted on oneself intentionally. A cut-off score of 5 or higher indicates eligibility for this disorder. The convergent validity of this tool has been reported to be 0.73, as measured by the borderline personality self-report measure (Sansone et al., 1998). Additionally, Sansone et al. (1998) demonstrated the convergent validity of this tool with depression and childhood trauma history. The reliability of this tool, as measured by the Cronbach α, was reported to be 0.80 (Sansone et al., 2018). In the study by Yang et al. (2024), the Cronbach α was found to be 0.79. In this study, the Cronbach α for this tool was 0.85.

The cognitive emotion regulation questionnaire (CERQ-18) is an 18-item questionnaire, developed by Garnefski et al. (2001). It assesses emotional regulation strategies. The tool comprises two subscales: adaptive strategies (5 subscales) and maladaptive strategies (4 subscales). The subscales include self-blame (items 1 and 2), acceptance (items 3 and 4), rumination (items 5 and 6), positive refocusing (items 7 and 8), planning (items 9 and 10), positive reappraisal (items 11 and 12), perspective taking (items 13 and 14), catastrophizing (items 15 and 16), and other-blame (items 17 and 18). Scores for adaptive strategies are obtained by summing the scores from the subscales of perspective-taking, positive refocusing, positive reappraisal, acceptance, and planning. Scores for maladaptive strategies are obtained by summing the scores from the subscales of self-blame, other-blame, rumination, and catastrophizing. The questionnaire is scored on a 5-point Likert scale, ranging from "never"=1 to "always"=5, with higher scores indicating better emotional regulation. The developers reported overall reliability coefficients of 0.87, with subscale reliabilities ranging from 0.73 to 0.88. In the study by Ballabrera et al., (2024) the Cronbach α for the adaptive strategies subscale was 0.84, and for the maladaptive strategies subscale, 0.76. In this study, the Cronbach α for this tool was 0.88.

Childhood trauma questionnaire (CTQ) is a 28-item scale, developed by Bernstein et al. (2003). It assesses 5 components of childhood trauma: Emotional abuse (items 3, 8, 14, 18, and 25); sexual abuse (items 20, 21, 23, 24, and 27); physical abuse (items 9, 11, 12, 15, and 17); emotional neglect (items 5, 7, 13, 19, and 28); and physical neglect (items 1, 2, 4, 6, and 26). Items 10, 16, and 22 do not fit into any of the components. Scoring is done on a 5-point Likert scale, with responses ranging from "never"=1 to "almost always"=5. Scores from the questionnaire range from 25 to 36 for low trauma, 41 to 51 for low to moderate trauma, 56 to 68 for moderate to severe trauma, and 73 to 125 for very severe trauma. The developers reported Cronbach α reliability coefficients ranging from 0.81 to 0.95, and concurrent validity with therapist ratings of childhood trauma was found to range from 0.59 to 0.78 (Sansone et al., 2018). In this study, the Cronbach α for childhood trauma was 0.82.

The attachment styles scale (ASS) was developed by Collins (1994). It is a self-report tool designed to assess relationship formation skills and self-descriptions of attachment styles toward close attachment figures. It was initially developed by Collins and Read (1990) based on Hazan and Shaver's (1987) theory, comprising 21 items, and later revised by Collins (1996) to 18 items. The scale includes three subscales: Secure attachment (items 1, 6, 8, 12, 13, and 17); anxious attachment (items 3, 4, 9, 10, 11, and 15); and avoidant attachment (items 2, 5, 14, 16, 17, and 18). Scoring is done using a 5-point Likert scale, where 1=strongly disagree, 2=somewhat disagree, 3=neither agree nor disagree, 4=somewhat agree, and 5=strongly agree. The developers reported Cronbach α reliability coefficients for secure attachment as 0.81, anxious attachment as 0.78, avoidant attachment as 0.85, and overall reliability as 0.71. The test, re-test reliability was also assessed, with coefficients for secure attachment (0.68), avoidant attachment (0.71), and anxious attachment (0.52) being significant at the 0.01 level. In this study, the Cronbach α for insecure attachment (avoidant and anxious) was calculated to be 0.83.

## Results

A total of 230 female students (54.34%) and 105 male students (45.65%) with a Mean±SD age of 16.56±1.13 years participated in this study. Table 1 presents the Mean±SD for the variables of self-harm, emotional regulation, childhood trauma, and insecure attachment styles, along with their components.

The results presented in Table 2 indicate that all Cronbach α values and the composite reliability of the research constructs exceed 0.7. Additionally, the average variance extracted (AVE) for the constructs is greater than 0.5, indicating that the reliability and convergent validity of the research model are acceptable. The results of discriminant validity reveal that the square root of the AVE for each construct is higher than its correlation with other constructs, suggesting that in the research model, latent variables interact more strongly with their respective items than with other constructs. In other words, Table 2 indicates the satisfactory discriminant validity of the model, confirming its adequate validity.

According to Table 3, the R-squared values for self-harm (0.45) and insecure attachment styles (0.48) are obtained, indicating a good fit of the model.

The values of $^{**}f^{2**}$ in Table 4 indicate a suitable effect size for the constructs of cognitive emotion regulation, childhood trauma, and insecure attachment styles.

To assess the overall model fit, which controls both the measurement and structural model components, the goodness-of-fit (GOF) index is used. GOF values of 0.10, 0.25, and 0.36 have been identified as weak, medium, and strong, respectively. This index can be calcu-

**Table 1.** Mean±SD of participants' scores in self-harm, emotional regulation, childhood trauma, and insecure attachment styles

| Variables | | | Mean±SD |
|---|---|---|---|
| Self-harm | Self-harm (total score) | | 11.31±2.45 |
| Emotional regulation | Adaptive coping strategies | Receptivity | 7.24±1.56 |
| | | Positive reappraisal | 6.53±1.32 |
| | | Positive Re-evaluation | 8.12±1.74 |
| | | Acceptance | 5.68±1.21 |
| | | Reappraisal focused on planning | 6.35±1.47 |
| | | Adaptive coping strategies (total score) | 18.42±4.21 |
| | Maladaptive coping strategies | Self-blame | 6.21±1.35 |
| | | Blaming others | 5.10±1.28 |
| | | Rumination | 7.45±1.64 |
| | | Catastrophizing | 6.89±1.58 |
| | | Maladaptive coping Strategies (total score) | 14.21±3.12 |
| | Emotional regulation (total score) | | 32.63±4.85 |
| Childhood trauma | Emotional abuse | | 12.45±2.84 |
| | Sexual abuse | | 8.32±1.93 |
| | Physical abuse | | 10.21±2.45 |
| | Emotional neglect | | 14.10±2.67 |
| | Physical neglect | | 9.45±1.82 |
| | Childhood trauma (total score) | | 56.50±5.32 |
| Insecure attachment styles | Ambivalent insecure Attachment | | 22.10±3.74 |
| | Avoidant insecure attachment | | 24.65±3.93 |
| | Insecure attachment styles (total score) | | 47.20±4.52 |

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lated using the geometric mean of the $R^2$ index and the average of the commonality indices.

Thus, the GOF value is calculated as Equation 1:

1. GOF=√average (commonality)×average ($R^2$)

GOF=√ average0.71×0.46=0.57

This GOF value of 0.57, when compared with acceptable values for GOF, indicates an adequate overall model fit.

After confirming the validity and reliability, the structural model of the research was evaluated. Structural equation modeling is used to test the conceptual model and research hypotheses.

Figure 2 presents the output model from the SmartPLS software.

The results presented in Table 5 indicate that insecure attachment styles (β=0.534; P<0.01) have a positive effect on self-harm. Cognitive emotion regulation (β=-0.488; P<0.001) has a negative effect on self-harm. Ad-

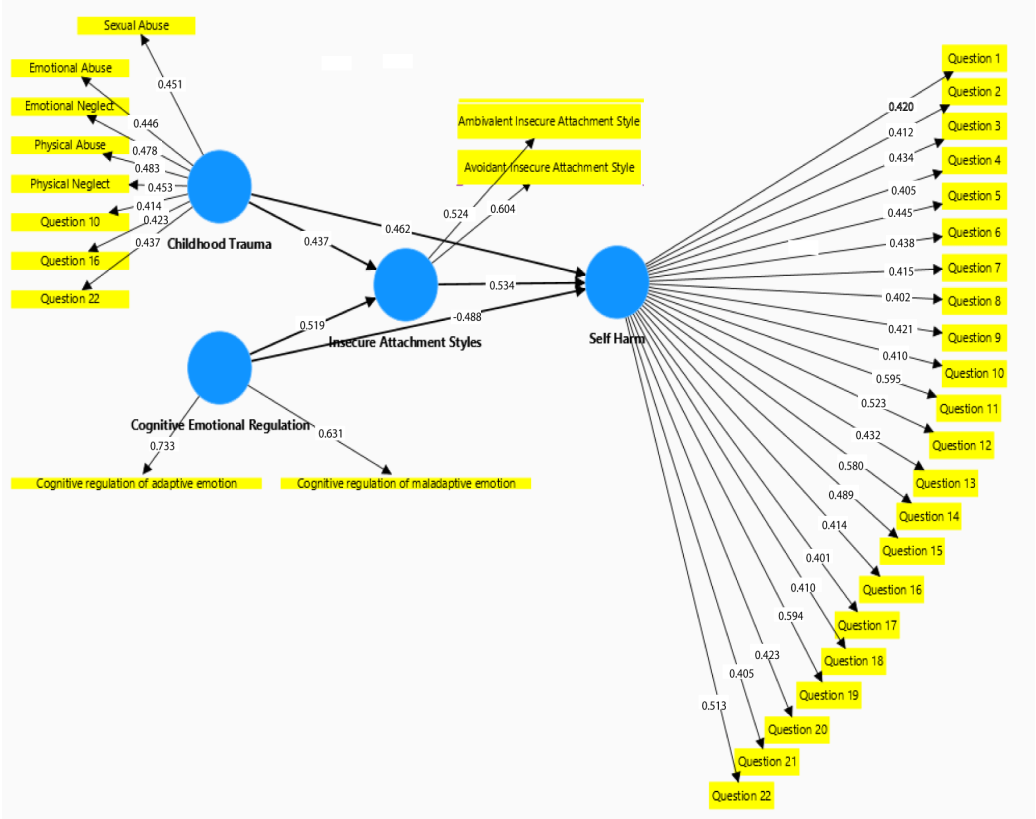


**Figure 2.** The model coefficient of measurement

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ditionally, childhood trauma (β=0.462; P<0.001) also exerts a positive effect on self-harm. Furthermore, both cognitive emotion regulation (β=0.277; P<0.05) and childhood trauma (β=0.233; P<0.05) have a significant indirect effect on self-harm through the mediating role of insecure attachment styles.

## Discussion

The present study aimed to develop a structural model to explain self-harm based on cognitive emotion regulation and childhood trauma, with the mediating role of attachment styles among students in Ardabil. The results of hypothesis 1 revealed a significant positive relationship between self-harm and cognitive emotion regulation. This finding aligns with the results of Putri and Hariyono (2023), Carvalho et al. (2023), Natividad et al. (2024), and Warne et al. (2023). In explaining this result, it can be stated that cognitive emotion regulation refers to processes through which an individual identifies, processes, and regulates their emotions to act effectively in various situations. This process can involve either avoiding negative emotions or actively managing and modifying them. Individuals with difficulties in cognitive emotion regulation are generally unable to employ effective and adaptive strategies to manage intense emotions and psychological challenges. For these individuals, the lack of emotion regulation skills may lead to maladaptive strategies such as rumination, self-blame, or immediate relief behaviors like

**Table 2.** Cronbach α, composite reliability, AVE, and divergent validity

| Construct | Cronbach α | Composite Reliability | AVE | Divergent Validity |
|---|---|---|---|---|
| Self-harm | 0.85 | 0.78 | 0.70 | 0.62 |
| Emotional regulation | 0.88 | 0.81 | 0.75 | 0.65 |
| Childhood trauma | 0.82 | 0.76 | 0.68 | 0.60 |
| Insecure attachment styles | 0.83 | 0.79 | 0.72 | 0.63 |

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**Table 3.** Structural model fit indices

| Construct | $R^2$ |
|---|---|
| Self-harm | 0.45 |
| Insecure attachment styles | 0.48 |

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**Table 4.** Effect size ($f^2$) index values

| Variables | Self-harm | Insecure Attachment Styles |
|---|---|---|
| Insecure attachment styles | 0.21 | - |
| Emotional regulation | 0.12 | 0.53 |
| Childhood trauma | 0.17 | 0.48 |

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self-harm. Various theories, including emotion regulation theory and self-regulation theory, emphasize the need for strategies that help individuals regulate negative emotions and reduce emotional harm. When an individual lacks the necessary abilities in this area, particularly in stressful and crisis, they may resort to self-harm as a means to alleviate intense emotions or provide temporary relief from psychological pain. In student populations, where academic, social, and family pressures can intensify negative emotions and anxiety, such behaviors emerge as a way to control feelings and cope with daily stress.

Based on these findings, it can be argued that difficulties in emotion regulation can serve as a contributing factor to self-harm. Individuals lacking adequate emotion regulation skills may subconsciously turn to self-harm as a way to relieve negative emotions. In this process, self-harm functions as a maladaptive coping mechanism aimed at reducing emotional tension and experiencing a sense of emotional numbness. Furthermore, these findings align with social psychology and cognitive theories, which suggest that individuals with emotion regulation difficulties tend to resort to self-harming and self-threatening behaviors over time to cope with emotional problems. Research emphasizes that poor emotion regulation can lead to psychological issues such as anxiety, depression, and self-harming behaviors. Studies also highlight that individuals who struggle with emotion regulation are more likely to use impulsive and maladaptive coping strategies to deal with their issues, with self-harm being one of these strategies. Therefore, improving emotion regulation skills, especially in students facing academic and social stress, can help prevent self-harm and improve mental health and emotional resilience in these groups.

**Table 5.** Path analysis of direct and indirect effects between main research variables

| Path | Hypothesis | Path Coefficient | t-value | Result |
|---|---|---|---|---|
| 1 | Insecure attachment style⟶Self-harm | 0.534 | 5.340 | Confirmed |
| 2 | Emotion regulation⟶Self-harm | -0.488 | 4.880 | Confirmed |
| 3 | Emotion regulation⟶Insecure attachment style | 0.519 | 5.190 | Confirmed |
| 4 | Childhood trauma⟶Self-harm | 0.462 | 4.620 | Confirmed |
| 5 | Childhood trauma⟶Insecure attachment style | 0.437 | 4.370 | Confirmed |
| 6 | Emotion regulation⟶Insecure attachment style⟶Self-harm | 0.277 | 1.946 | Confirmed |
| 7 | Childhood trauma⟶Insecure attachment style⟶Self-harm | 0.233 | 1.654 | Confirmed |

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Moreover, the results of hypothesis 2 indicate a significant positive relationship between self-harm and childhood trauma. This finding is consistent with the results of Shi et al. (2024), Liu et al. (2024), Choi and Song (2024), Fu et al. (2024), Lin (2024), Liu et al. (2024), van Schie et al. (2024), Wang (2024), and Yang et al. (2024). In explaining this result, childhood trauma, particularly negative emotional, physical, and sexual experiences, plays a fundamental role in the formation of maladaptive emotional and behavioral patterns. According to psychological theories such as the stress vulnerability model of childhood trauma and Bowlby's attachment theory, early traumatic experiences in childhood can lead to psychological harm and disruptions in emotion regulation, ultimately leaving the individual vulnerable to self-harming behaviors. These experiences can create insecure attachments, especially disorganized and anxious attachments, which make it difficult for the individual to manage negative emotions. As a result, self-harm is used as a coping mechanism to alleviate anxiety and inner pain. Empirical evidence also shows that childhood trauma can affect brain structures, particularly areas related to emotion regulation and impulse control, which can intensify impulsive and emotionally damaging reactions. In such cases, self-harm serves as an impulsive coping mechanism to deal with negative feelings and internal anxiety, particularly in individuals with difficulties in processing emotions. These findings highlight the importance of considering the long-term effects of childhood trauma in the development of maladaptive behavioral patterns, especially self-harm, which can inform preventive and therapeutic interventions in this area.

The results of hypothesis 3 also reveal a significant positive relationship between self-harm and attachment styles. This finding is in line with the results of Bai (2024), Finch et al. (2024), Gong and Zhang (2024), Lucherini Angeletti et al. (2024), Silva Filho et al. (2023), Wang et al. (2024), and Zhanga and Li (2024). In explaining this result, it can be stated that attachment style, particularly during childhood, forms the foundation for many emotional and behavioral patterns in adulthood. According to Bowlby's attachment theory, individuals develop emotional experiences and responses through their early interactions with primary caregivers, which in turn influence their behavior in subsequent relationships. Individuals with insecure attachment styles, especially anxious or disorganized attachments, typically struggle with processing and regulating their emotions. As a result, they are more prone to use self-harming behaviors as a coping strategy to manage anxiety and emotional pain. These individuals consistently face challenges in interpersonal relationships and social interactions, leading to feelings of distrust, loneliness, and worthlessness. Such feelings can ultimately lead to self-harm as a temporary solution to alleviate negative emotions. Specially, insecure attachment styles (anxious, avoidant, and disorganized) significantly impact how stress and emotions are managed. People with these styles often resort to extreme behaviors, such as self-harm, due to their inability to find effective support systems or express their emotional needs, seeking a sense of control and relief from internal pressures. Furthermore, insecure attachment can negatively influence an individual's ability to use healthy coping mechanisms, increasing their vulnerability to psychological harm. The findings of this study suggest that insecure attachment styles, as mediating factors, can strengthen the relationship between childhood trauma and self-harm, putting individuals at a higher risk for these behaviors. Thus, insecure attachment styles can serve as a key element in understanding and predicting self-harming behaviors, making them an important focus for therapeutic and psychological interventions aimed at reducing such harms.

The results of this research indicate that childhood trauma and cognitive emotion regulation have a significant impact on self-harm, with insecure attachment styles playing a mediating role in this relationship. The findings underscore the significance of psychological interventions aimed at enhancing emotional regulation and promoting secure attachment styles, thereby reducing self-harming behaviors among students. One limitation of the present study is the use of self-report methods to collect data through questionnaires. This method, relying on participants' subjective perceptions, may be influenced by cognitive and social biases, potentially reducing the reliability of the data. Additionally, the limited sample size of secondary school students in Ardabil reduces the generalizability of the results to other age groups and cultural contexts. Furthermore, the study's failure to control contextual variables such as socioeconomic status, family support, and the quality of interpersonal relationships may influence the severity and patterns of self-harm behaviors. To address these limitations, future research should consider using multidimensional methods for data collection, including semi-structured interviews, neuropsychological assessments, and direct observations, which can enhance the accuracy and reliability of the data. Expanding the sample to include students from diverse geographic and cultural backgrounds, particularly those from other age groups, can enhance the generalizability of the results. Additionally, further control of contextual variables and their inclusion in more advanced statistical models, such as structural equation modeling, can help more precisely explain the

relationship between childhood trauma, cognitive emotion regulation, attachment styles, and self-harm. From a practical standpoint, the results of this study underscore the importance of targeted psychological interventions in reducing self-harming behaviors. It is recommended that schools implement educational and therapeutic programs to increase awareness about the consequences of childhood trauma, improve cognitive emotion regulation, and enhance secure attachment styles. These programs could include teaching coping skills, enhancing emotional self-efficacy, and providing psychological support to at-risk students. Moreover, organizing workshops for teachers and school counselors on early detection and intervention for self-harming behaviors can help prevent the escalation of these behaviors. Finally, collaboration between psychologists, the education system, and families within support and treatment programs can play a critical role in reducing the psychological harms caused by childhood trauma.

## Conclusion

The present study developed and tested a structural model of self-harm among adolescents, incorporating cognitive emotion regulation and childhood trauma as predictors, with insecure attachment styles as a mediating factor. The findings demonstrated that both cognitive emotion dysregulation and childhood trauma significantly predict self-harming behaviors, directly and indirectly through insecure attachment styles. Insecure attachment emerged as a crucial mediator that exacerbates the impact of early trauma and emotional dysregulation on self-injury. These results highlight the intricate interplay between emotional, developmental, and relational factors in the emergence of self-harm. From a practical perspective, the findings suggest that prevention and intervention programs targeting adolescent self-harm should focus on enhancing adaptive emotion regulation strategies and fostering secure attachment patterns, particularly in students with a history of trauma. Implementing school-based mental health interventions and family-focused therapies can mitigate the risk factors identified in this model. Future research should address the limitations of self-report data and limited geographic scope by incorporating longitudinal, multi-method approaches and diverse samples.

## Ethical Considerations

### Compliance with ethical guidelines

This study was approved by the Ethics Committee of University of Mohaghegh Ardabili, Ardabil, Iran (Code: IR.UMA.REC.1403.079). The clear explanation of the purpose and procedures of this study, together with all pros and cons related to this work, was clearly and accurately explained to each of the respondents, based on which the written and informed voluntary consent of all participants in this project was collected. Participants were also informed of and guaranteed their right to withdraw at any stage without consequence, and that their information would be kept confidential and anonymous

### Funding

This research did not receive any grant from funding agencies in the public, commercial, or non-profit sectors.

### Authors' contributions

Conceptualization, supervision, and data collection: Esmaeil Sadri Damirchi; Methodology: Mohammadreza Noroozi Homayoon; Data analysis: Fatemeh Ghohari; Investigation and writing: All authors.

### Conflict of interest

The authors declared no conflict of interest.

### Acknowledgments

The authors express their gratitude to the students and schools that participated in the study.

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