



## Research Paper

# The Role of Childhood Trauma, Cognitive Flexibility, and Cognitive Distortions in Predicting Self-Harming Behaviors Among Female Adolescents



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**Running Title** Predictors of Adolescent's Self-Harming Behaviors

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## ABSTRACT

**Background:** Increasing public health concerns are being raised about adolescent self-harming behaviors. The previous study indicates that childhood trauma can be related to self-harm.

**Objectives:** The study aimed to investigate the relationship between childhood trauma, cognitive flexibility, and cognitive distortions in predicting self-harming behaviors among female adolescents in Shahrood, Iran.

**Materials & Methods:** The research method was cross-sectional. The statistical population of the study included all female students in the junior high schools of Shahrood, Iran in the academic year 2022-23. A sample of 220 female adolescents (aged 13–15) was recruited through multi-stage sampling. Participants had at least one self-harming behavior in their clinical records. The child Trauma Questionnaire (CTQ), Cognitive Flexibility Inventory-Iranian Version, The Cognitive Distortion Scale, and Self-Harm Behavior Questionnaire were completed. Data were analyzed using the Pearson correlation coefficient and multivariate linear regression model.

**Results:** The mean age of study participants was 13.70±1.02, almost 73% of the samples were from 13 to 14 years old, and most students came from three- and four-member families (81%). Findings of multivariate linear regression revealed that childhood trauma ( $\beta=0.137$ ,  $t=2.828$ ) and cognitive distortions ( $\beta=0.188$ ,  $t=3.940$ ) were positive and significant predictors of self-harming behaviors in adolescents. Moreover, Cognitive flexibility ( $\beta=-0.237$ ,  $t=-4.957$ ) was a negative and significant predictor of self-harming behaviors in adolescents.

**Conclusion:** The results of this study may have implications for increasing mental health awareness among students and school programs to prevent self-harm.

**Keywords:** Childhood trauma, Cognitive, Flexibility, Distortion, Self-harming behavior

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## 1. Introduction

Adolescents worldwide experience a high rate of neuropsychiatric disorders, accounting for 16% of the burden of illness and injury among persons aged 10 to 19 years [1]. There is a high prevalence of neuropsychiatric disorders among adolescents worldwide, accounting for 16% of the burden of illness and injury among people between 10 and 19 years old [1]. Increasing public health concerns are being raised about adolescent self-harming behaviors. There is a high risk of suicide for those who engage in this behavior, regardless of whether they intend to die [2]. Results indicate that childhood trauma is related to self-harm [3]. Many important conclusions can be drawn from studies; According to the majority of studies, there was a positive correlation between dissociation severity and deliberate self-harm in adolescents and a few studies suggest that dissociation moderates the connection between childhood trauma and self-harm in adolescents [4].

A child's and an adolescent's reaction to traumatic experiences are shaped by a variety of factors, such as their developmental stage and their previous experience. Despite this, the majority of those affected by traumatic experiences express some type of distress or behavioral change following these experiences [1]. A variety of risk factors may contribute to self-harming behavior, including childhood abuse, low self-esteem, social isolation, impulsivity, hopelessness, bullying, mental illness, perfectionism, and self-criticism. Families can also negatively impact by negative experiences, such as maladaptive parenting, family adversity, and dysfunctional parent-child attachments, as well as low socioeconomic status [5].

A person with cognitive flexibility can change their perspective both spatially and interpersonally, and come up with new approaches to problems e.g. "thinking outside the box". According to some studies, individuals who commit deliberate self-harm may have difficulty in distancing themselves from aversive emotional experiences or other triggers associated with deliberate self-harm, as well as switching their focus to alternative stimuli [6]. Considering a variety of challenging stimuli, these findings suggest that people who deliberately self-harm may not be able to shift to more adaptive emotion-regulating strategies due to a lack of cognitive flexibility. Similarly, Garreto et al. found that patients with deliberate self-harm demonstrated significantly lower problem-solving ability and mental flexibility than patients with non-psychiatric self-harm [7]. Miranda et al. found that cognitive inflexibility predicted suicidal ideation in individuals with prior suicidal behavior [8].

Cognitive distortions contribute to self-harming behavior in addition to cognitive impairments. Depression vulnerability is believed to be increased by cognitive distortions [9]. Unknowingly, many people suffer from cognitive distortions and do not have the appropriate tools to deal with them. A cognitive distortion occurs when we think automatically and irrationally, usually negatively and inaccurately [10]. In a similar vein, Liu et al. defined cognitive distortion as an error in making a statement or claim [11]. As Guglielmo points out, cognitive distortion is a form of clinically problematic cognition related to specific statuses and scopes of practice. The presence of cognitive distortions and negative cognition among adolescents is associated with suicide ideation [12]. Several researchers have investigated the relationship between cognitive distortion, self-injury, and suicidal ideation. The repeated occurrence of these distortions can result in psychological disorders and abnormal behavior. Many disorders, such as depression and anxiety, in adolescents are caused by cognitive distortions. Individuals who have self-injured are more likely to suffer from these mental disorders [13].

Bauer and Canon found that students aged 11-15 have significantly higher cognitive distortion levels than other students. Additionally, there was a significant positive relationship between the three variables [14]. It is evident from the findings that the three variables were closely related to secondary school students' self-harm behavior [11, 15, 16]. A cognitive distortion is rarely assessed in studies of deliberate self-harm. Furthermore, deliberate self-harm in adolescents is an increasing clinical problem, but the mechanisms causing or maintaining this behavior are not well understood. Due to some evidence that girls are more likely to suffer from NSSI than boys, gender was included as a covariate. In addition, since previous studies have linked depression with NSSI, depressive symptoms were assessed and correlated. In addition to female gender and concurrent depression symptoms, negative life events were hypothesized to be uniquely and positively associated with NSSI [11, 14, 16]. Despite the high prevalence of self-harm in adolescent girls, few studies have assessed it in Iran. It is necessary to pay more attention to the childhood trauma and cognitive functions of this group of adolescents. In this regard, this study aims to the relationship between childhood trauma, cognitive flexibility, and cognitive distortions in predicting self-harming behaviors in adolescents.

## 2. Materials and Methods

### Study type and population

The research method was a descriptive cross-sectional study. The statistical population of the study included all female students studying at the junior high schools of Shahrood, Iran in 2022-23. The self-harm behaviors were diagnosed by counselors of the research team and according to the Self-Harm Inventory (SHI), which consists of 22 items with dichotomous scoring (yes/no) assessing the direct and indirect self-harm behaviors. Higher scores on this scale indicate higher severity of self-harm behaviors. In this study, zero indicates no self-harm behavior while score 1 and higher represents different degrees of self-harm behaviors. Female students with a score of more than 5 who were satisfied to cooperate in the study were included. A multistage random cluster sampling method was used to select female students in grades 7 to 9 from six schools. Three classes were randomly selected from each school in each of the three districts and all members of these classes were screened for self-harming behavior based on the questionnaire. Finally, 235 female students with self-harm were selected. Considering fifteen distorted questionnaires, 220 questionnaires were analyzed. Before conducting the study, the subjects provided their written consent; they were informed about the issue and the methodology; the researcher pledged to protect the subjects' private information; they were given the instructions needed to complete the survey; participation in this study did not entail financial burden for the subjects.

### Measures

The child trauma questionnaire (CTQ) developed by Bernstein et al. [17] was used to measure childhood trauma. This questionnaire is a screening tool to reveal individuals with experiences of childhood abuse and neglect. The questionnaire can be used for both adults and teenagers and measures five types of misbehavior in childhood, including sexual abuse, physical abuse, emotional abuse, and emotional neglect. There are 28 questions, 25 of which are used to measure the main components of the questionnaire and 3 of which are used to identify people who deny their childhood problems. High scores in the questionnaire indicate more trauma or injury. The scoring of the latter 3 items was intended to measure the validity or denial of childhood issues. If the total number of answers given to these questions was higher than 12, there was a high probability that the person's answers are invalid. The range of scores for each subscale is 5 to 25 and for the whole questionnaire is

25 to 125. In the research of Bernstein et al. [17], Cronbach's alpha coefficient of the questionnaire on a group of teenagers for the dimensions of emotional abuse, physical abuse, sexual abuse, emotional neglect, and emotional neglect was 0.87, 0.86, 0.95, 0.89, and 0.78, respectively. Also, its concurrent validity with therapists' ratings of the number of childhood traumas has been reported in the range of 0.59 to 0.78 [17]. In Iran, Chegeni et al. reported the Cronbach alpha of this questionnaire from 0.81 to 0.98 for its five components [18]. In this study, Cronbach's alpha of all the items was 0.84.

Cognitive Flexibility Inventory-Iranian created by Dennis and Vondra [19] is a short self-report tool with 20 questions. Its scoring is based on a 7-point Likert scale from 1 to 7, where a higher score indicates more cognitive flexibility [19]. The minimum score in this questionnaire is 20 and the maximum score is 140. Higher scores indicate greater psychological flexibility. These researchers obtained Cronbach's alpha reliability for the whole scale, perception of controllability, and perception of different options as 0.91, 0.91, and 0.84 respectively. Shareh et al. [20] investigated the psychometric properties of this instrument in the Iranian sample. The test-retest reliability coefficient for the entire scale was 0.71 and for the subscales of controllability, perception of different options, and perception of justification of behavior were 0.55, 0.72, and 0.57, respectively. In the current research, Cronbach's alpha coefficient for the entire scale was 0.9 and for the subscales was from 0.55 to 0.89.

The Cognitive Distortion Scale created by Ellis [21] contains 20 statements that were used to measure cognitive distortions. This questionnaire was scored based on the 5-Likert scale. Depending on the answers given, the points are assigned from 1 to 5, where completely agree is 1, agree is 2, don't have an opinion is 3, disagree is 4, and completely disagree is 5. Only question number one is scored inversely from 5 to 1. Based on the scoring, anyone who gets a higher score has more appropriate thinking, and whoever gets a lower score has used more cognitive distortions. The range of scores in the questionnaire is between 20 and 100. The sub-scales of this questionnaire include All-or-nothing thinking, Overgeneralizing, Selective abstraction / mental filter, Disqualifying the positive, Emotional reasoning, Magnification & minimization, emotional reasoning, labeling, and personalization. The reliability of the questionnaire according to Cronbach's alpha coefficient was 0.80 and based on the test-retest approach after two weeks was 0.67 for the whole scale and from 0.7 to 0.76 for the subscales [22].

Inventory of Statements About Self-injury (ISAS) is a self-reported instrument containing 39 questions and assesses the frequency and performance of injurious behaviors with non-suicidal intent. The items are rated in the form of a three-point Likert scale, graded as 0 (completely unrelated), 1 (somewhat related), and 2 (completely related). The internal consistency of the scale using Cronbach's alpha method was 0.84 [23]. The Persian version of the scale was validated by Rezaei et al., which confirmed its construct and convergent validity. The reliability of the scale according to Cronbach's alpha was 0.76 [24]. In the current research, Cronbach's alpha was 0.73.

### Statistical analysis

Descriptive statistics such as frequency, percent, mean, and standard deviation (SD) were used. The assumption of normal distribution was assessed using Kolmogorov-Smirnov (KS) test. Spearman correlation coefficient and multivariate linear regression were used to estimate the association between variables. All analysis was performed in SPSS software version 26.

### 3. Results

The mean age of study participants was  $13.70 \pm 1.02$ . Of total, 80 individuals (36%) were in grade 7, 75 (34%) were in grade 8, and 65 students were in grade 9. Almost 73% of the sample were from 13 to 14 years old and most students (81%) belong to three and four-member families. Regarding the parental education level, 44% of fathers compared to 36% of mothers had a high school education, while 20% of mothers were college educated. The family's socioeconomic status was classified as low-income (income under 30,000,000 Rials) (27%), middle-income (income between 50,000,000 and 90,000,000 Rials) (55%), and high-income (income above 90,000,000 Rials) (17%). Families were classified as either "intact" (both parents) (73%) or "single parent" (27%).

Table 1 shows descriptive statistics of study variables. According to the KS test, the normality assumption was met for all variables

The bivariate correlation coefficient identified a significant positive correlation between childhood trauma and self-harming behaviors in adolescents ( $r=0.356$ ;  $P<0.01$ ). Moreover, there was a significant negative correlation between cognitive flexibility and self-harming behaviors ( $r=-0.563$ ,  $P<0.01$ ) and a significant positive correlation between cognitive distortions and self-harming behaviors in adolescents ( $r=0.432$ ;  $P<0.01$ ).

Table 2 illustrates the result of a multivariate linear regression model. The model accounted for 32.1% of the variance in self-harming behaviors in adolescents. The variance inflation factor (VIF) showed that there was no multicollinearity between variables (VIF=1.18 to 1.22). Beta coefficients of childhood and cognitive distortions indicate that childhood trauma ( $\beta=0.137$ ,  $t=2.828$ ), and cognitive distortions ( $\beta=0.188$ ,  $t=3.940$ ) were positive and significant predictors of self-harming behaviors in adolescents. Moreover, Cognitive flexibility ( $\beta=-.237$ ,  $t=-4.957$ ) was a negative and significant predictor of self-harming behaviors in adolescents.

### 4. Discussion

This study aimed to investigate the relationship between childhood trauma, cognitive flexibility, and cognitive distortions in predicting self-harming behaviors in adolescents. The results of this study revealed that self-harming behaviors were associated with childhood trauma and cognitive distortions. In addition, greater self-reported cognitive flexibility was associated with more self-reported self-harming behaviors. Concerning childhood trauma, the results were consistent with both developmental models of self-harm and studies indicating a relationship between childhood trauma and self-harm [2, 25, 26]. Numerous studies have shown that

**Table 1.** Descriptive statistics of the variables

Scale	Mean $\pm$ SD	Min	Max	KS	P
Self-harming behaviors Score range (0-78)	66.7 $\pm$ 6.54	15	65	0.070	0.200
Child Trauma Score range (5-125)	54.75 $\pm$ 9.24	25	112	0.076	0.072
Cognitive Flexibility Score range (20-140)	87.29 $\pm$ 14.16	20	121	0.075	0.070
Cognitive distortions Score range (20-100)	48.58 $\pm$ 7.56	20	97	0.075	0.068

SD, Standard deviation; KS, Kolmogorov Smirnov test

**Table 2.** Predictors of self-harming behaviors in adolescents

Construct	Unstandardized Coefficient	SE	95%CI Lower, Upper	Standardized Coefficient	t	P
Intercept	1.824	4.873	[0.065, 0.232]	-	0.374	0.708
Child Trauma	0.054	0.019	[0.117, 0.243]	0.137	2.828	0.005
Cognitive Flexibility	-0.259	0.052	[0.088, 0.187]	-0.237	-4.957	0.001
Cognitive distortions	0.171	0.043	[0.032, 0.148]	0.188	3.940	0.001

SE, standard error



childhood trauma can lead to extensive adverse and lasting effects, such as chronic fatigue syndrome [27], poor academic achievements [28], adulthood depression and anxiety symptoms, and early drug abuse [29].

To support these findings, it should be noted that childhood trauma undermines children's ability to develop positive adaptations, and in turn, the vulnerability of children's adaptive resources leads them to adopt flawed alternative regulatory and relational strategies such as self-harm. According to trauma experts, even though individuals report self-harm for several reasons, they are reacting to perceived uncomfortable feelings and overwhelming emotions [26]. Another explanation for our findings is that deliberate self-harm is significantly associated with shame and feelings of inferiority (low social rank), and difficulties with interpersonal functioning may be a potential pathway for increased suicidal attempts due to social anxiety [30]. In addition, self-harm, suicide attempts, and suicidal ideation have not only complex psychological mechanisms but the underlying biological factors have also been continuously reported [31].

Based on Nock's theory, self-harm develops to cope with adverse events. To cope with adversity, resilience is a defensive mechanism that integrates the capabilities of the physical, mental, social, and intellectual systems. An individual can therefore utilize these resources to cope with environmental stresses, such as childhood maltreatment. In this regard, adolescents with high resilience may be more able to acquire and mobilize these resources to face the negative effects of abusive or neglectful family environments. Research has shown that victims of negative life encounters who were more resilient reported having fewer psychological problems and were more likely to engage in healthy living [32].

Shahab, & Taklavi showed that there was a significant negative correlation between adverse childhood experiences with emotion regulation and cognitive flexibility. The results of the regression analysis showed that

29.5% of emotion regulation was explained by adverse childhood experiences [33]. Also, 50.6% of cognitive flexibility was explained by adverse childhood experiences. Moreover, they found a negative and significant correlation between adverse childhood experiences with emotion regulation and cognitive flexibility in teenage students. From this finding, it can be concluded that the early development period and family member treatment, relationships, and health condition are the key factors in predicting later life emotional and cognitive growth and function [33]. Findings in previous research implicated the role of cognitive flexibility and impulsivity in suicide risk in individuals with mental illness within the general population [34]. Difficulty managing impulsivity and maintaining cognitive flexibility may increase the risk of impulsive self-harm behaviors as these functions are critical for slowing down and identifying alternative actions that yield more optimal outcomes. Furthermore, a recent review of the literature indicated that neuropsychological performance on tasks of inhibition and decision-making may distinguish those with self-harm [34].

Odaci et al. found that all sub-dimensions of childhood trauma are positively associated with substance abuse proclivity. Furthermore, all sub-dimensions of childhood abuse experience were negatively correlated with cognitive flexibility [35]. Their mediation test results indicated that cognitive flexibility may partly mediate the association between childhood abuse experiences and substance abuse. Between 13 and 23% of the effect of childhood, traumatic experiences on substance abuse tendency were explained by cognitive flexibility. A mediating variable analysis revealed that cognitive flexibility partially mediated all aspects of childhood abuse experiences and substance abuse tendencies. Using mediation analysis, it was discovered that cognitive flexibility partially mediated childhood abuse experiences and substance abuse tendencies. A decline in cognitive performance is linked to intrusive thoughts, functional avoidance, ruminative feelings, and dissociative states. Several models regard dissociative experiences as the

natural destruction of multiple mental processes, including memories, thoughts, and feelings [36]. As a result of cognitive flexibility, individuals are aware that there are alternatives for every situation and can adapt to them. Additionally, it refers to the ability of a person to alter his or her cognition in response to changing environmental conditions [19]. This ability allows individuals to replace compelling and maladaptive thoughts with balanced and adaptive thoughts, to create alternatives, and to evaluate difficult situations to improve their ability to cope with them [20]. A person's cognitive flexibility is their capacity to develop strategies for dealing with new and unexpected situations in their surroundings [35].

According to this study, cognitive distortions were significantly associated with self-harm behaviors. In light of the lack of literature research to support our finding, the definition of cognitive distortions in this section is that they are "inaccurate or biased ways of attending to or interpreting experiences", leading to problematic emotional responses and behaviors. Self-centered distortions, the primary self-serving cognitive distortions, show that one considers the views, expectations, needs, rights, immediate feelings, and desires of oneself so important that it scarcely considers or ignores the legitimate views of others (or even one's long-term interests) [10].

Cognitive distortion, as well as other cognitive impairment factors, often precede and maintain psychopathology. The previous pilot study examined Chatbot-delivered cognitive defusion versus cognitive restructuring. In addition to cognitive errors (such as overgeneralizations, disasters, and selective abstraction), cognitive triads (such as a negative view of oneself, one's world, and one's future) have also been found to be associated with depression among youth. It has also been demonstrated that cognitive impairment is associated with anxiety among adolescents [32-36]. Weismore & Esposito-Smythers found that adolescents who suffer from psychiatric disorders or have a higher risk of getting involved in the onset of any disorder have a higher tendency to experience cognitive impairment [15]. Cognitive distortion can also contribute to self-harm involvement and maintenance, similar to psychiatric disorders [2, 3].

A cognitive distortion is a way the mind convinces us of something that is not true or true. These inaccurate thoughts are usually used to reinforce negative thoughts or emotions by telling yourself things that seem rational and accurate, but only prevent someone from feeling bad about themselves. These negative biases in one's perception of themselves, others, and their surroundings cause emotional distress and are believed to increase suscepti-

bility to deliberate self-harm [37, 38]. There are several limitations to this study. The cross-sectional nature of the data precluded the determination of causal relationships between the variables. In addition, the non-measurement of socioeconomic variables within families, the amount of self-reported data, etc., need to be taken into account in future research. This sample primarily consisted of only Shahrood female adolescents with self-harm behaviors. Thus, the findings may not apply to other populations, including community-based samples of adolescents, minority groups, or adolescents who choose not to participate in research studies.

## 5. Conclusion

Study results have shown that self-harm behaviors are associated with childhood trauma, cognitive flexibility, and cognitive distortions and that they can predict self-harm behaviors among female adolescents. To prevent self-harm, it is necessary to examine adolescents' cognitive distortion, life events, and self-harming thoughts. The results may have implications for increasing mental health awareness among students and school programs to prevent self-harm.

## Ethical Considerations

### Compliance with ethical guidelines

In the current study, subject-related ethical considerations were observed through the Ethics committee (Code: IR.PNU.SHAHROOD.REC.1400.06).

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### Authors' contributions

All authors equally contributed to preparing this article.

### Conflict of interest

The authors declared no conflict of interest.

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