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Developing a Model of Tendency toward Risky Behaviors Based on Cognitive Emotion Regulation with the Mediating Role of Self-Control in Adolescents

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ABSTRACT

Risky behaviors during adolescence are considered one of the serious challenges in the field of mental and social health, which can lead to broad negative consequences for both the individual and society. The present study aimed to develop a model of the tendency toward risky behaviors based on cognitive emotion regulation, with the mediating role of self-control in adolescents. This study, which was descriptive-correlational in nature and based on structural equation modeling, included 312 students (158 girls and 154 boys), aged 13 to 16 years, from Jahrom city during the 2023–2024 academic year, who were selected through a multistage cluster sampling method. Participants completed the Risk-Taking Scale by Zadeh-Mohammadi et al. (2011), the Tangney Self-Control Scale (2004), and the Cognitive Emotion Regulation Questionnaire by Garnefski et al. (2006). The results of structural equation modeling showed that the proposed model had a good fit. Both self-control and adaptive cognitive emotion regulation strategies had a significant and negative direct effect on risky behaviors, while maladaptive cognitive emotion regulation strategies had a significant and positive direct effect on risky behaviors. Moreover, through the mediating role of self-control, adaptive cognitive emotion regulation strategies had a significant indirect negative effect on risky behaviors, and maladaptive strategies had a significant indirect positive effect on risky behaviors. The findings of this study demonstrated that cognitive emotion regulation plays an important role in predicting the tendency toward risky behaviors in adolescents, and this effect is partially mediated by self-control. Accordingly, it can be concluded that strengthening emotion regulation and self-control skills may serve as effective strategies in reducing risky behaviors among adolescents.

Keywords: cognitive emotion regulation, self-control, tendency toward risky behaviors

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Introduction

Adolescence represents a critical stage of human development, characterized by substantial biological, cognitive, emotional, and social transitions. During this period, individuals often experience heightened vulnerability to engaging in risky behaviors, including substance use, unsafe sexual activity, violence, and

reckless decision-making. These behaviors not only threaten adolescents' physical health but also compromise psychological adjustment and future life trajectories (1). Research suggests that such behaviors are often clustered, influenced by multifaceted risk factors, and frequently intertwined with challenges such as depression, difficulties in emotion regulation, and limited self-control capacities (2). Understanding the determinants of risky behaviors and identifying protective psychological mechanisms, therefore, remain priorities for psychological science, public health, and education.

One of the most important psychological constructs associated with adolescent health-risk behaviors is **self-control**. Defined as the capacity to regulate thoughts, emotions, and behaviors in pursuit of long-term goals, self-control has been repeatedly linked with resilience, well-being, and positive developmental outcomes (3). Adolescents with higher self-control are more likely to succeed academically, maintain positive peer relationships, and resist engagement in substance abuse or delinquent behaviors (4). For instance, findings demonstrate that self-control facilitates healthier lifestyle choices across multiple domains by influencing mechanisms such as goal pursuit, habit formation, attentional control, and stress management (4, 5). Conversely, deficits in self-control can render adolescents susceptible to impulsive choices, leading to substance use, cyber aggression, and maladaptive coping responses (6, 7).

Empirical investigations have shown that self-control not only predicts engagement in risky behaviors but also moderates the impact of contextual factors. For example, research in China revealed that parent–adolescent relationships significantly predict adolescents' risk-taking behaviors, and this association is buffered by high levels of self-control (8). Similarly, self-control has been shown to mitigate the influence of maladaptive personality traits and negative emotional experiences on health-compromising behavior (6, 9). Moreover, self-control interventions have proven beneficial in promoting academic success and emotional resilience, indicating its malleability and importance for adolescent development (3, 10).

Another crucial construct closely tied to adolescent risky behaviors is **cognitive emotion regulation**. According to cognitive-behavioral frameworks, individuals differ in the strategies they use to regulate their emotional responses to stress and adversity (11). Adaptive strategies such as positive reappraisal, refocusing, acceptance, and planning are associated with psychological well-being and resilience, while maladaptive strategies such as rumination, self-blame, catastrophizing, and other-blame are linked to psychopathology, including depression and anxiety (11, 12). In adolescence, where heightened emotional reactivity and identity exploration occur, the choice of cognitive emotion regulation strategies becomes particularly influential for behavioral adjustment (13).

Maladaptive cognitive strategies have been consistently associated with risk behaviors. For example, social anxiety and poor regulation strategies predict problematic smartphone and social media use, reflecting how difficulties in cognitive regulation extend to digital contexts (12). In another study, cognitive emotion regulation mediated the link between coping difficulties and risky behaviors, emphasizing the role of regulation processes in explaining why some adolescents resort to maladaptive behaviors when confronted with stress (14). Similarly, metacognitive beliefs about the uncontrollability of thoughts and emotions exacerbate the relationship between poor regulation strategies and high-risk behaviors (15). Conversely, structured training in emotion regulation has been shown to reduce irritability, impulsivity, and tendencies toward high-risk behavior among vulnerable adolescent groups (16, 17).

The interaction between self-control and cognitive emotion regulation appears particularly important. Adolescents with greater self-control are more capable of deploying adaptive regulatory strategies while avoiding maladaptive patterns, thereby reducing their vulnerability to risky behaviors (13, 18). Evidence suggests that trait self-control is linked to more efficient regulation of emotions at both behavioral and neural levels (18). Self-control also mediates the relationship between identity formation and risk-taking, such that adolescents with stronger identity and self-regulatory capacities are less likely to engage in dangerous behaviors (19). Further, difficulties in emotion regulation have been conceptualized as transdiagnostic mechanisms explaining the link between early adversity, such as child maltreatment, and the later emergence of psychopathology (20). These findings converge to highlight that both self-control and cognitive emotion regulation must be studied together to better understand the dynamics of risky behavior in adolescence.

Research across diverse contexts supports the critical role of these constructs. Studies in Iranian adolescents reveal that deficiencies in emotion regulation and inhibition predict risky behaviors, especially among girls (21), while attachment styles and low self-control predict risky behaviors among female students in Tehran (22). Similarly, other investigations in Iranian populations demonstrate that spiritual intelligence and self-control are correlated with healthier coping and lower risk engagement (23). Structural models also confirm that emotion regulation predicts addiction readiness, with spirituality serving as a mediator (24). These culturally specific insights align with international evidence, suggesting the universality of self-control and regulation mechanisms across adolescent populations.

At the same time, contextual differences must not be overlooked. Research among American Indian youth, for example, shows distinct latent classes of substance use behaviors compared to White students living on or near reservations (25). In Kenya, adolescent risky behaviors cluster differently depending on rural cultural and socioeconomic conditions (2). In Western contexts, detained female youth report higher rates of suicidality and health-risk behaviors than their community counterparts, underscoring the role of systemic and environmental risk factors (26). Additionally, adolescents' perspectives on health-risk screening highlight the importance of personalized, culturally sensitive interventions (27). These findings emphasize that while self-control and cognitive emotion regulation are central constructs, their operation is embedded in broader social, cultural, and structural environments.

Expanding the scope, research on maladaptive regulation strategies such as rumination and catastrophizing has revealed their broader influence on digital-age risks. For instance, negative emotional regulation predicts internet addiction, showing how traditional risk constructs adapt to new technological contexts (9). Cognitive flexibility has also emerged as a complementary construct to regulation and self-control, with neuropsychological and neuroscientific approaches underscoring its importance for adaptive decision-making (28). Without sufficient cognitive flexibility, adolescents may become "stuck" in maladaptive strategies, escalating impulsive and risk-prone tendencies.

Furthermore, cross-disciplinary perspectives reveal additional pathways. For example, organizational psychology demonstrates that knowledge management and organizational culture enhance agility, paralleling how adolescents require flexible regulatory skills for adaptive functioning (29). Similarly, studies in urbanism and education remind us that structural and environmental contexts, from city design (30) to technological development (31), shape the psychosocial environment in which adolescents regulate behavior.

These findings underscore the importance of ecological and systemic perspectives in understanding adolescent risky behavior.

Taken together, the literature demonstrates that adolescent engagement in risky behaviors is the product of a dynamic interplay between self-control, cognitive emotion regulation, and contextual conditions. Adaptive regulatory skills and strong self-control consistently buffer against health-risk behaviors, while maladaptive strategies and poor regulation amplify vulnerabilities (21, 32). These insights converge with evidence from neuroscience, developmental psychology, and cross-cultural studies, highlighting the need for integrated models that consider both individual-level mechanisms and broader sociocultural contexts.

The present study builds on this body of knowledge by developing and testing a structural model in which cognitive emotion regulation predicts adolescents' tendency toward risky behaviors, with self-control as a mediating factor.

Methods and Materials

Study Design and Participants

This research was applied in terms of objective and quantitative in terms of data type. In terms of implementation, both field and library methods were used, and in terms of data collection, it was a descriptive-correlational study of the structural equation modeling type.

The statistical population of this study included all adolescents studying in the first and second secondary schools of Jahrom city during the 2023–2024 academic year. The sampling method used was multistage cluster sampling. First, a list of girls' and boys' lower and upper secondary schools in Jahrom was prepared. In the first stage, three girls' schools (Alavieh, Poyandeh, and Hejab) and three boys' schools (Imam Khomeini, Safir, and Shahed) were randomly selected. In the second stage, based on the class population in each school, one or two classes were randomly chosen, and all students in those classes participated in the study. The final composition of the sample based on educational levels was as follows: Girls' schools: Alavieh (10th grade), Poyandeh (9th and 10th grades), Hejab (7th and 8th grades). Boys' schools: Imam Khomeini (7th and 9th grades), Shahed (10th grade), and Safir (7th and 8th grades). In total, 154 questionnaires from boys' schools and 158 questionnaires from girls' schools were collected and entered into statistical analysis.

Data Collection

The Iranian Adolescent Risk-Taking Scale was developed by Zadeh-Mohammadi et al. (2011). This questionnaire contains 38 items and is designed to measure adolescents' risk-taking across various dimensions (tendency toward drug use, alcohol use, smoking, violence, sexual relationships and behavior, relationships with the opposite sex, and dangerous driving). Zadeh-Mohammadi et al. (2011) confirmed the validity of this scale using exploratory factor analysis and the principal components method. To assess reliability, Cronbach's alpha was reported as 0.938 for the total scale, 0.931 for smoking, 0.906 for drug use, 0.907 for alcohol use, 0.856 for sexual relationships and behavior, and 0.809 for tendency toward the opposite sex. In the present study, construct validity was confirmed through confirmatory factor analysis. Cronbach's alpha coefficients were calculated and confirmed as reliability indices, with a value of 0.94 for the total scale and a range of 0.74 to 0.93 for the subscales, indicating good reliability.

The Self-Control Scale was developed by Tangney et al. (2004). This questionnaire includes 36 items and aims to assess individual self-control across dimensions such as self-regulation, deliberate/impulsive actions, healthy habits, work ethics, and reliability. Tangney et al. (2004) confirmed the validity of the scale by evaluating its correlation with measures of academic achievement, adjustment, positive relationships, and interpersonal skills. They also reported test-retest reliability over two weeks as 0.89 and Cronbach's alpha reliability as 0.89. In Iran, Mousavi-Moghaddam et al. reported Cronbach's alpha reliability as 0.82, and in another study by Mafi and Hovasi-Somar, Cronbach's alpha reliability was found to be 0.75. In the present study, confirmatory factor analysis results of the items showed that the factor model of the Self-Control Scale had a good fit in the target population. Cronbach's alpha coefficients were calculated and confirmed as reliability indices.

The Cognitive Emotion Regulation Questionnaire was designed by Garnefski and Kraaij in 2006. This inventory includes 18 items and aims to assess cognitive emotion regulation strategies in response to threatening and stressful life events. It consists of two general subscales: adaptive cognitive emotion regulation strategies (positive) and maladaptive cognitive emotion regulation strategies (negative). The questionnaire is scored on a 5-point Likert scale. Yousefi evaluated the validity and reliability of this scale in Iranian adolescents. Cronbach's alpha reliability was reported as 0.78 for the maladaptive subscale and 0.83 for the adaptive subscale. In the present study, confirmatory factor analysis was conducted to examine construct validity. Given the two distinct and heterogeneous dimensions, each subscale was analyzed separately. Results showed that both adaptive and maladaptive dimensions demonstrated good fit in the target population. Cronbach's alpha coefficients were calculated and confirmed as reliability indices.

Data Analysis

Data were analyzed using structural equation modeling (SEM) with AMOS software to test the hypothesized relationships among cognitive emotion regulation strategies, self-control, and risky behaviors. Prior to analysis, assumptions including univariate and multivariate normality, outlier detection using Mahalanobis distance, and multicollinearity were examined and confirmed. Descriptive statistics, including means, standard deviations, skewness, and kurtosis, were calculated for all variables. Correlation analyses were conducted to assess associations among study variables. Model fit was evaluated using multiple fit indices, including chi-square/df, GFI, AGFI, TLI, CFI, RMSEA, and PCLOSE, based on established cutoffs. To estimate the significance of direct, indirect, and total effects, the bootstrap method was applied, allowing for robust estimation of mediating effects in the proposed model.

Findings and Results

The descriptive indices of the demographic variables of the study are examined and reported in the table below.

Table 1. Descriptive Indices of Demographic Variables of the Study

Variable	Category	Frequency	Percentage	Cumulative Percentage
Gender	Girl	158	50.6	50.6
	Boy	154	49.4	100
	Total	312	100	-
Age	13 years old	91	29.2	29.2
	14 years old	63	20.2	49.4

	15 years old	74	23.7	73.1
	16 years old	84	26.9	100
Father's Education	Below diploma	55	17.6	17.6
	Diploma	62	19.9	37.5
	Associate degree	52	16.7	54.2
	Bachelor's degree	71	22.8	76.9
	Master's degree	59	18.9	95.8
	Seminary	13	4.2	100
Mother's Education	Below diploma	61	19.6	19.6
	Diploma	62	19.9	39.4
	Associate degree	48	15.4	54.8
	Bachelor's degree	67	21.5	76.3
	Master's degree	69	22.1	98.4
	Seminary	5	1.6	100
Living Status	Normal (living with father and mother)	285	91.4	91.4
	Living only with mother	12	3.8	95.2
	Living only with father	15	4.8	100
	Total	312	100	

The variables of this study were classified as endogenous, exogenous, and mediating according to the method of analysis (structural equation modeling). The descriptive indices of the variables based on this classification were presented. In Table 1, the descriptive indices of the research variables and their related components are reported.

Table 2. Descriptive Indices of the Research Variables

Variable / Components	Min	Max	Mean	SD	Skewness	Kurtosis
Adaptive Cognitive Emotion Regulation						
Putting into perspective	2	10	7.89	2.68	1.54	0.59
Positive refocusing	2	10	7.56	2.57	1.09	-0.48
Positive reappraisal	2	10	8.26	2.33	0.86	1.74
Acceptance	2	10	8.16	2.96	-0.54	0.52
Refocus on planning	2	10	7.46	2.95	-0.33	-0.98
Total Score	10	50	39.33	7.83	0.45	-0.42
Maladaptive Cognitive Emotion Regulation						
Self-blame	2	10	3.36	2.12	1.12	1.17
Other-blame	2	10	4.45	2.54	1.85	1.56
Rumination	2	10	3.57	2.36	-0.49	-1.12
Catastrophizing	2	10	4.86	3.09	-0.74	1.47
Total Score	8	40	16.24	6.28	0.77	-0.83
Self-Control						
Self-regulation	24	54	44.61	6.77	-0.84	-0.51
Deliberate/Impulsive Actions	20	49	40.30	6.54	-0.98	-0.17
Healthy habits	10	25	20.28	3.39	-0.92	0.09
Work ethics	11	25	20.42	3.19	-0.91	0.02
Reliability	9	25	20.38	3.23	-0.88	0.21
Total Score	98	169	146.01	21.57	-0.76	-1.06
Tendency toward Risky Behaviors						
Tendency toward drugs	12	31	20.66	4.84	0.83	1.63
Tendency toward alcohol	9	26	15.35	4.45	1.18	1.96
Tendency toward smoking	6	19	12.77	2.99	0.52	1.38
Tendency toward violence	6	19	12.90	2.81	0.33	1.77
Tendency toward sexual relationships/behavior	5	18	10.08	2.75	0.81	1.94
Tendency toward relationship with opposite sex	4	19	10.18	2.01	0.64	1.24
Tendency toward dangerous driving	10	26	15.38	4.31	0.93	1.86
Total Score	78	137	97.34	14.24	1.60	1.75

In the present study, in order to conduct structural equation modeling, it was necessary to examine and confirm several assumptions. These assumptions are addressed below.

To test the normality of the data, the Shapiro–Wilk test was used. The statistic of this test for all variables was above the conventional level ($p > .05$), and consequently, the null hypothesis was accepted. The null hypothesis of this test states that there is no difference between the sample distribution graph and the normal distribution graph. Based on the results, the assumption of normal distribution of data for all variables was confirmed. To assess multivariate normality, Mardia's coefficient was used. In this test, a kurtosis value greater than 3 may indicate a non-normal distribution (Kline, 2016). The critical value of this test was 1.96 at the .05 significance level. The multivariate kurtosis for the data of this study was 2.302, and the T value of this test was 9.413. Given that the kurtosis value was lower than the cutoff point of 3 and the T statistic was higher than 1.96, the multivariate normality of this analysis was confirmed.

One of the assumptions of using structural equation modeling is the examination and removal of outliers. In this analysis, Mahalanobis distances were used to test this assumption. In this study, the Mahalanobis value for all data was calculated and compared with the chi-square index. With a 95% confidence level and 2 degrees of freedom (based on the variables entered into the Mahalanobis distance, n-1), the chi-square value was 5.991. The highest Mahalanobis distance obtained in the present analysis was 4.113. Comparing these two values indicated that none of the Mahalanobis distances exceeded the chi-square value, and consequently, there were no outliers among the participants' responses. Based on these results, this assumption was confirmed. Correlation values among the variables of the study were also within an acceptable range (between .30 and .90). Given the correlation coefficients and their acceptable levels of significance, this assumption was also confirmed.

To examine the research question, the general model of the study was developed and implemented in AMOS software. This was performed, and the output of the software with all significant paths (with no paths removed) is shown in the figure below.

Using the bootstrap method, regression weights of direct and indirect paths and their significance levels were calculated. Table 3 shows the standardized coefficients of direct, indirect, and total effects of the existing paths in the model.

Table 3. Standardized Coefficients of Direct, Indirect, and Total Effects of the Study

Predictor Variable	Criterion Variable	Direct Effect	Indirect Effect	Total Effect
Adaptive Cognitive Emotion Regulation	Tendency toward Risky Behavior	-0.55	-0.18	-0.73
Maladaptive Cognitive Emotion Regulation		0.48	0.16	0.64
Self-Control		-0.34	–	-0.34

As observed in Table 3, adaptive cognitive emotion regulation strategies, with a combined direct and indirect effect of -0.73, were the strongest predictor of the tendency toward risky behaviors. Maladaptive cognitive emotion regulation strategies, with a total effect of 0.64, ranked second. All direct, indirect, and total effects were at desirable levels of significance.

To examine the fit of the final research model in the statistical population, model fit indices were calculated using AMOS software. Table 4 presents the fit indices of the model along with the acceptable values of each index according to the criteria proposed by Kline (2016).

Table 4. Fit Indices of the Research Model

Index	χ^2/df	GFI	AGFI	TLI	CFI	RMSEA	PCLOSE
Obtained Values	2.109	0.916	0.902	0.958	0.942	0.071	0.079
Desired Values	< 3	> 0.90	> 0.90	> 0.90	> 0.90	< 0.08	> 0.05

According to the results in the table above, the chi-square divided by degrees of freedom was 2.109. The values of the Goodness of Fit Index (GFI) and Adjusted Goodness of Fit Index (AGFI), which indicate the proportion of variance and covariance explained by the model, were 0.916 and 0.902, respectively. The Comparative Fit Index (CFI), which compares the target model with the independent model, was 0.942. The Tucker–Lewis Index (TLI), as a non-normed fit index, was estimated at 0.958. The Root Mean Square Error of Approximation (RMSEA) and its associated PCLOSE value were 0.071 and 0.079, respectively. All model fit indices were within acceptable ranges, confirming that the model had a desirable fit.

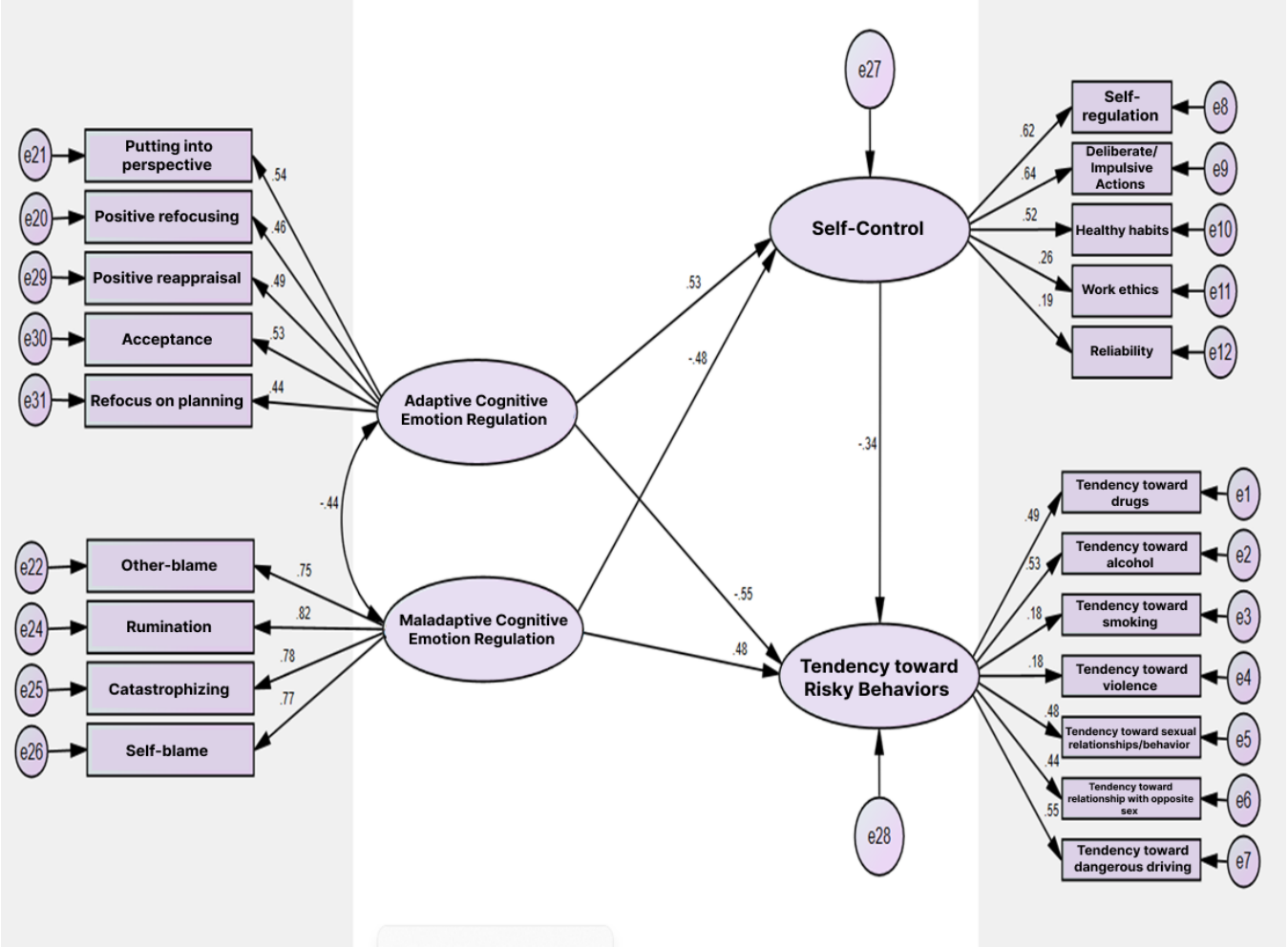

Figure 1. Final Model of the Study

Discussion and Conclusion

The primary objective of this study was to investigate the predictive role of cognitive emotion regulation strategies on adolescents' tendency toward risky behaviors, with self-control as a mediating variable. The results revealed that adaptive cognitive emotion regulation strategies exert a significant negative direct effect on risky behaviors, while maladaptive strategies produce a significant positive direct effect. Moreover, self-control demonstrated a significant negative direct effect on risky behaviors, and further analyses showed that self-control mediated the relationship between cognitive emotion regulation strategies and risky

behaviors. These findings support the hypothesized model, indicating that adolescents who employ adaptive regulatory strategies and possess stronger self-control capacities are less likely to engage in risky behaviors. Conversely, reliance on maladaptive regulation strategies coupled with low self-control increases vulnerability to risk-taking.

The direct negative effect of adaptive cognitive emotion regulation strategies on risky behaviors is consistent with prior literature highlighting the protective role of positive reappraisal, acceptance, and refocusing strategies in adolescent adjustment. For instance, Garnefski and Kraaij (11) reported that adolescents who regularly employ adaptive regulation strategies experience fewer depressive and anxiety symptoms, which in turn lowers the likelihood of turning to maladaptive coping behaviors. This aligns with the current findings, suggesting that adaptive regulation helps adolescents reinterpret stressful experiences in less threatening ways, thereby reducing the impulse to engage in health-compromising activities. Similarly, Yousefi (17) showed that training in emotion regulation improved self-control and reduced sensation-seeking tendencies among adolescent girls, further underscoring the protective role of adaptive regulation strategies.

On the other hand, the observed positive association between maladaptive regulation strategies and risky behaviors resonates with findings by Zsido et al. (12), who demonstrated that maladaptive strategies such as rumination and catastrophizing significantly predicted problematic smartphone and social media use, a modern form of risk-taking. Likewise, Khatib et al. (14) identified emotion regulation difficulties as mediators between coping failures and risky behaviors, highlighting the vulnerability associated with maladaptive regulation. Our findings therefore reinforce the assertion that maladaptive regulation fosters persistent negative emotional states, which adolescents may attempt to escape through risky behaviors such as substance use, unsafe sexual activities, or aggressive acts.

The mediating role of self-control in the relationship between cognitive emotion regulation and risky behaviors provides deeper insight into the mechanisms underlying adolescent decision-making. Self-control, understood as the ability to inhibit impulses and align behavior with long-term goals, has been repeatedly linked with lower engagement in risk-taking (3). The present findings align with those of Conner et al. (4), who found that self-control influenced health behaviors through multiple pathways including habit regulation, emotional regulation, and motivational alignment. By mediating the effects of cognitive emotion regulation, self-control appears to act as a regulatory "filter," strengthening the influence of adaptive strategies and weakening the effects of maladaptive strategies on risky behaviors.

This mediating effect has also been documented in prior studies. Liang et al. (7) found that self-control mediated the relationship between cognitive processes and negative risk-taking in late adolescents, indicating that cognitive resources alone are insufficient without the capacity to regulate impulses. Liu et al. (8) similarly identified self-control as a moderator of the relationship between parental relationships and adolescent risk-taking, emphasizing its central role in developmental outcomes. Together, these findings affirm the crucial position of self-control as a bridge between cognition and behavior, particularly in adolescence when self-regulatory capacities are still maturing.

The present results also revealed that adaptive regulation strategies exert both direct and indirect effects on risky behaviors, with the total effect being the strongest predictor in the model. This dual pathway indicates that while adaptive strategies reduce risky behavior directly by altering cognitive appraisals, their

influence is amplified when combined with strong self-control. Pan et al. (18) reported similar findings, demonstrating that trait self-control enhances the efficiency of emotion regulation at both behavioral and neural levels. Khawar et al. (13) also observed that adolescents with higher self-regulation employed adaptive strategies more frequently, thereby reducing vulnerability to maladaptive behaviors. These convergent findings highlight the synergistic interplay between adaptive regulation and self-control in safeguarding adolescents from risk engagement.

Conversely, maladaptive strategies exerted both direct and indirect positive effects on risky behaviors. This indicates that adolescents who engage in rumination, self-blame, or catastrophizing are directly more prone to risky behaviors, but these strategies also undermine self-control, thereby exerting additional indirect influence. This echoes the work of Mirzaei-Feizabadi et al. (21), who found that difficulties in regulation and inhibition predicted risky behaviors among adolescent girls, with inhibitory failures serving as a mechanism through which poor regulation translated into maladaptive outcomes. Similarly, Weissman et al. (20) conceptualized emotion regulation difficulties as transdiagnostic mechanisms linking early adversity with later psychopathology, suggesting that maladaptive strategies may erode self-control and elevate long-term vulnerability to multiple forms of dysfunction.

These findings carry important cross-cultural implications. In Iranian samples, Shahi et al. (22) reported that attachment styles and self-control jointly predicted risky behaviors among female adolescents, consistent with our finding that self-control is a key protective mechanism. Kazemi et al. (19) also identified self-control as a mediator between identity dimensions and risky behaviors among adolescent boys, reinforcing the developmental universality of this process. Similarly, Ordabadi and Mohammadi (32) reported that cognitive emotion regulation strategies significantly influenced risky behaviors in adolescents, echoing the central conclusion of the present research. Such consistency across cultural contexts emphasizes the robustness of these mechanisms in explaining adolescent risk engagement.

Evidence from other international contexts provides further alignment. For example, Wang et al. (1) found that adolescents with depression who engaged in risky health behaviors demonstrated lower self-control and higher difficulties in regulation. Hatcher et al. (26) identified suicidality and risky behaviors among detained female youth, attributing these to deficits in regulation and impulse control. Stanley and Swaim (25) documented distinct substance use patterns among American Indian and White adolescents, yet self-control emerged as an important differentiating factor across groups. Similarly, Sewanyana et al. (2) observed clustering of risky behaviors in Kenyan adolescents, again implicating poor regulation and self-control as underlying drivers. Taken together, these studies substantiate the global relevance of the present findings.

The results also align with recent advances in understanding the neural and cognitive mechanisms underlying regulation. Hohl and Dolcos (28) reviewed measures of cognitive flexibility, showing that flexibility supports adaptive regulation, whereas deficits may perpetuate maladaptive strategies. Our findings can be interpreted in light of this, suggesting that adolescents with limited cognitive flexibility may rely more on maladaptive regulation and demonstrate lower self-control, thus elevating risk behaviors. Similarly, Liang et al. (9) found that regulation mediated the relationship between negative emotion and internet addiction, pointing to cognitive mechanisms through which emotion dysregulation translates into contemporary risk behaviors.

Beyond adolescence, related evidence suggests broader developmental and systemic influences. For instance, Lu-Ying (31) emphasized the mediating role of self-differentiation in regulating behavioral outcomes, which parallels the mediating effect of self-control observed in this study. Likewise, broader systemic studies show how organizational culture and knowledge management enhance adaptability (29), an analogy that reflects how individual-level regulation and self-control enhance adaptability during adolescence.

The present study thus contributes to a growing body of evidence suggesting that interventions targeting both self-control and cognitive emotion regulation are critical to reducing adolescent risky behaviors. Training in adaptive strategies such as positive reappraisal and planning may directly lower risky behavior tendencies, while simultaneously strengthening self-control capacities that serve as mediators. Prior work supports this approach: Shokohhandeh (16) demonstrated that regulation-focused treatments improved self-control in adolescents, and Samsami and Mohammadkhani (15) found that maladaptive metacognitive beliefs could be addressed through targeted interventions. Moreover, evidence from preventive education programs (10, 17) demonstrates that self-control and regulation skills are malleable and can be effectively enhanced through structured training.

In summary, this study provides empirical evidence supporting the central role of cognitive emotion regulation and self-control in adolescent risky behaviors. Adaptive regulation and strong self-control act as protective factors, while maladaptive regulation undermines control and fosters risky engagement. The mediation model highlights self-control as a pivotal mechanism translating regulatory strategies into behavioral outcomes. These findings not only align with previous research across diverse cultures and contexts but also extend the literature by empirically confirming the mediating role of self-control in the relationship between regulation and risky behaviors in adolescents.

Despite its contributions, the present study has certain limitations. First, the cross-sectional design restricts the ability to draw firm causal conclusions about the relationships between cognitive emotion regulation, self-control, and risky behaviors. Longitudinal studies are needed to capture developmental trajectories and establish temporal precedence. Second, the data relied on self-report measures, which are subject to biases such as social desirability and inaccurate self-perception, particularly among adolescents. Third, the study was conducted within a single geographic region, which may limit the generalizability of findings to adolescents in different cultural or socioeconomic contexts. Fourth, the study focused primarily on cognitive emotion regulation and self-control but did not incorporate other relevant constructs such as peer influence, parental monitoring, or neurocognitive functioning, which could further illuminate the pathways to risky behavior. Finally, although structural equation modeling provided robust insights into the relationships among variables, the model was limited by the variables included, leaving room for unexplored mediators or moderators.

Future studies should employ longitudinal and experimental designs to more clearly establish causal relationships between cognitive emotion regulation, self-control, and risky behaviors. It would be valuable to explore developmental changes across early, middle, and late adolescence, as the role of regulation and self-control may shift over time. Expanding research to diverse cultural and socioeconomic contexts can help to determine the universality versus cultural specificity of these mechanisms. Incorporating neurobiological measures, such as brain imaging or psychophysiological indicators, could provide deeper insights into the

cognitive and neural bases of regulation and self-control. Future research may also examine the interplay between family dynamics, peer influences, and digital media environments, as these contextual factors increasingly shape adolescent risk-taking. Additionally, intervention studies are needed to evaluate the efficacy of integrated programs that simultaneously enhance adaptive regulation and self-control skills.

In practical terms, the findings highlight the importance of designing and implementing prevention and intervention programs that focus on strengthening adolescents' self-control and adaptive emotion regulation skills. School-based curricula can incorporate training in positive reappraisal, planning, and acceptance strategies, alongside exercises that build inhibitory control and impulse regulation. Clinicians and counselors working with adolescents can integrate cognitive-behavioral techniques that target maladaptive strategies while reinforcing adaptive coping. Parents and educators should be engaged in supporting adolescents to practice and reinforce these skills in daily life. Community-based health promotion initiatives can also address structural and cultural factors that influence adolescent regulation and behavior. Ultimately, multi-level approaches that integrate psychological training, educational practices, and community support may prove most effective in reducing adolescent engagement in risky behaviors and promoting healthier developmental outcomes.

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Authors' Contributions

All authors equally contributed to this study.

Declaration of Interest

The authors of this article declared no conflict of interest.

Ethical Considerations

The study protocol adhered to the principles outlined in the Helsinki Declaration, which provides guidelines for ethical research involving human participants. The ethics code of the Ethics Committee of Research, Islamic Azad University, Isfahan (Khorasgan) Branch, was approved under the number IR.IAU.KHUISF.REC.1401.313 on December 19, 2022.

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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