

A Structural Model of Adolescents' Externalizing Behaviors Based on Early Maladaptive Schemas, Alexithymia, and Reward Sensitivity: The Mediating Role of Self-Control and the Moderating Role of Autonomous Motivation

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Article Info

Article type:

Original Research

How to cite this article:

Navidi Moghadam, M. (2026). A Structural Model of Adolescents' Externalizing Behaviors Based on Early Maladaptive Schemas, Alexithymia, and Reward Sensitivity: The Mediating Role of Self-Control and the Moderating Role of Autonomous Motivation. *Iranian Journal of Neurodevelopmental Disorders*, 5(6), 1-13.
<https://doi.org/10.61838/kman.jnnd.911>



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ABSTRACT

Purpose: The present study aimed to develop and test a structural model of adolescents' externalizing behaviors based on early maladaptive schemas, alexithymia, and reward sensitivity, with the mediating role of self-control and the moderating role of autonomous motivation.

Methods and Materials: This descriptive-correlational study employed structural equation modeling to examine the proposed relationships among the study variables. The statistical population consisted of high school students in Tehran during the 2025–2026 academic year. Using a multistage cluster sampling method, 620 adolescents were selected and completed the Youth Self-Report Externalizing Problems Scale, Young Schema Questionnaire–Short Form, Toronto Alexithymia Scale, Sensitivity to Reward Questionnaire, Self-Control Scale, and Autonomous Motivation Scale. Data were analyzed using SPSS-27 and AMOS-26 through descriptive statistics, Pearson correlation analysis, confirmatory factor analysis, structural equation modeling, bootstrapping procedures, and latent interaction analysis.

Findings: The results indicated that early maladaptive schemas, alexithymia, and reward sensitivity had significant positive direct effects on externalizing behaviors. Furthermore, all three predictor variables demonstrated significant negative effects on self-control, whereas self-control exhibited a significant negative effect on externalizing behaviors. Bootstrapping analyses confirmed the mediating role of self-control in the relationships between early maladaptive schemas and externalizing behaviors, alexithymia and externalizing behaviors, and reward sensitivity and externalizing behaviors. The interaction analysis revealed a significant moderating effect of autonomous motivation on the relationship between self-control and externalizing behaviors, indicating that the protective influence of self-control was stronger among adolescents with higher levels of autonomous motivation. The final structural model demonstrated satisfactory fit indices and explained 58% of the variance in self-control and 67% of the variance in externalizing behaviors.

Conclusion: The findings support an integrative developmental model suggesting that adolescents' externalizing behaviors are influenced by cognitive vulnerabilities, emotional

processing deficits, and motivational tendencies both directly and indirectly through self-regulatory mechanisms. Self-control serves as a key explanatory pathway linking maladaptive schemas, alexithymia, and reward sensitivity to behavioral problems, while autonomous motivation strengthens the protective effects of self-regulation. Interventions aimed at enhancing self-control, emotional awareness, adaptive schema functioning, and autonomous motivation may be effective in preventing and reducing externalizing behaviors among adolescents.

Keywords: *Externalizing Behaviors, Early Maladaptive Schemas, Alexithymia, Reward Sensitivity, Self-Control, Autonomous Motivation, Adolescents*

1. Introduction

Adolescence is a critical developmental period characterized by profound biological, cognitive, emotional, and social changes that substantially influence psychological adjustment and behavioral functioning. While most adolescents successfully navigate these developmental transitions, a considerable proportion exhibit maladaptive behavioral patterns, including aggression, impulsivity, rule-breaking, oppositional behaviors, delinquency, and other forms of externalizing behaviors. Externalizing behaviors represent one of the most significant public health concerns during adolescence because of their association with academic failure, interpersonal difficulties, substance use, criminal involvement, and long-term psychological maladjustment. Contemporary developmental psychopathology frameworks emphasize that externalizing behaviors emerge through the interaction of cognitive, emotional, motivational, and self-regulatory processes rather than being the product of a single causal factor (Dorjee, 2024; Sheppard, 2023). Consequently, identifying the psychological mechanisms that contribute to the development and maintenance of externalizing behaviors among adolescents has become an important objective for researchers and mental health professionals.

Recent theoretical models suggest that maladaptive cognitive structures established during childhood play a central role in shaping behavioral and emotional outcomes during adolescence. Among these structures, early maladaptive schemas have received substantial empirical attention. Early maladaptive schemas are pervasive cognitive-emotional patterns regarding oneself, others, and the world that develop in response to unmet emotional needs and adverse childhood experiences. These schemas influence the interpretation of environmental events and often predispose individuals to dysfunctional emotional and behavioral responses. Research has demonstrated that maladaptive schemas are associated with a broad range of psychological difficulties, including emotional

dysregulation, personality pathology, addictive behaviors, depression, anxiety, and interpersonal dysfunction (Inchausti et al., 2025; Pilkington et al., 2023). The persistence of these schemas throughout adolescence may contribute to the development of externalizing behaviors by increasing hostility, mistrust, impulsivity, and difficulties in adapting to social expectations.

Evidence supporting the relationship between maladaptive schemas and behavioral problems has continued to accumulate in recent years. For example, research has shown that maladaptive schemas are linked to maladaptive coping styles and behavioral dysregulation in both clinical and non-clinical populations (Estévez et al., 2023). Furthermore, a systematic review and meta-analysis demonstrated robust associations between early maladaptive schemas, emotional dysregulation, and alexithymia, suggesting that schemas may indirectly influence behavioral outcomes through emotional processing difficulties (Pilkington et al., 2023). Similarly, findings from Iranian populations have indicated that maladaptive schemas contribute significantly to emotional and psychosomatic difficulties through their effects on emotional regulation mechanisms (Farahi et al., 2023). These findings suggest that early maladaptive schemas may represent a foundational vulnerability factor underlying adolescents' externalizing behavioral tendencies.

Another construct increasingly recognized as a predictor of maladaptive adolescent outcomes is alexithymia. Alexithymia refers to difficulties in identifying, understanding, and describing emotional experiences, accompanied by an externally oriented cognitive style. Adolescents with elevated alexithymia often experience problems recognizing internal emotional states and regulating negative affect effectively. Because emotions cannot be adequately identified or communicated, emotional distress may be expressed through behavioral actions rather than reflective processing. Consequently, alexithymia has been associated with aggression, impulsivity, risk-taking behaviors, substance use, eating disorders, and various

forms of psychopathology (Gao et al., 2025; Pace et al., 2022).

Recent evidence has strengthened the argument that alexithymia plays a critical role in the development of behavioral difficulties among adolescents. Studies have shown that childhood adversity contributes to aggression and other maladaptive outcomes through increased alexithymia (Duan et al., 2025; M. Zhang et al., 2025). Similarly, research has demonstrated that alexithymia mediates the relationship between traumatic experiences and psychological distress, thereby increasing vulnerability to maladaptive behavioral responses (Gao et al., 2025; X. Zhang et al., 2025). During adolescence, when emotional systems are rapidly developing, deficits in emotional awareness may significantly impair social adaptation and increase the likelihood of externalizing behavioral manifestations. Research conducted during and after the COVID-19 pandemic further highlighted the importance of alexithymia in adolescent adjustment, demonstrating its association with emotional suppression, psychological symptoms, and reduced coping effectiveness (Pace et al., 2022; Zhang et al., 2022).

Emerging neuropsychological perspectives suggest that alexithymia is closely connected to deficits in interoception, defined as the perception and interpretation of internal bodily signals. Interoceptive dysfunction has increasingly been viewed as a transdiagnostic risk factor underlying multiple forms of psychopathology and maladaptive behavior (Bonaz et al., 2021; Brewer et al., 2021). Individuals who experience difficulties recognizing internal emotional and physiological states often demonstrate elevated emotional dysregulation and behavioral impulsivity. Research examining interoception has shown that alexithymia mediates the effects of interoceptive deficits on emotional and behavioral dysfunction (Zdankiewicz-Ścigala et al., 2021). Additional investigations have demonstrated similar relationships among individuals experiencing addictive behaviors, eating pathology, and emotional difficulties (Lyvers & Thorberg, 2023; Lyvers, Truncali, et al., 2022). These findings suggest that alexithymia may constitute an important mechanism through which cognitive vulnerabilities translate into behavioral problems.

In addition to cognitive and emotional factors, motivational and neurobehavioral processes have been increasingly recognized as significant determinants of adolescent externalizing behaviors. Reward sensitivity refers to individual differences in responsiveness to

rewarding stimuli and the tendency to pursue pleasurable experiences. According to reinforcement sensitivity theory, individuals characterized by elevated reward sensitivity are more likely to engage in impulsive and risk-oriented behaviors in pursuit of immediate gratification. During adolescence, developmental changes in reward-processing systems may increase susceptibility to sensation-seeking, risk-taking, and behavioral dysregulation. Consequently, heightened reward sensitivity has been associated with problematic internet use, addictive behaviors, impulsivity, and various externalizing outcomes (Lyvers et al., 2025; Tagliaferri et al., 2025).

Several studies have demonstrated significant associations between reward sensitivity and behavioral dysregulation. Research investigating excessive exercise, binge eating, and addictive behaviors has found that individuals with elevated reward sensitivity often exhibit reduced capacity to regulate behavior effectively (Lyvers, Kelahroodi, et al., 2022; Lyvers, Truncali, et al., 2022). Similarly, recent evidence suggests that reward sensitivity and alexithymia may interact in predicting maladaptive behavioral outcomes, particularly when executive functioning and emotional regulation processes are compromised (Lyvers et al., 2025). These findings imply that reward sensitivity may increase adolescents' vulnerability to externalizing behaviors, especially when protective self-regulatory mechanisms are insufficient.

Although maladaptive schemas, alexithymia, and reward sensitivity appear to contribute independently to externalizing behaviors, contemporary psychological theories increasingly emphasize the importance of self-regulation mechanisms in explaining how these vulnerabilities influence behavioral outcomes. Self-control is generally defined as the capacity to regulate thoughts, emotions, impulses, and behaviors in accordance with long-term goals and social expectations. Strong self-control enables adolescents to inhibit inappropriate responses, delay gratification, manage emotional distress, and engage in adaptive decision-making. Conversely, deficits in self-control have consistently been associated with aggression, delinquency, substance use, impulsivity, and various forms of externalizing psychopathology (Elvin et al., 2024; Wen, 2023).

From a developmental perspective, self-control may function as a critical mechanism linking cognitive and emotional vulnerabilities to behavioral outcomes. Adolescents who possess maladaptive schemas, difficulties processing emotions, or heightened reward sensitivity may

experience greater challenges in regulating impulses and behavior. As a result, self-control may mediate the influence of these risk factors on externalizing behaviors. Support for this proposition can be found in research demonstrating that executive functioning and self-regulatory capacities mediate the relationship between childhood adversity and aggressive behavior (M. Zhang et al., 2025). Likewise, cognitive control processes have been identified as essential determinants of emotional and behavioral adjustment among children and adolescents (Elvin et al., 2024). Intervention studies have further highlighted the effectiveness of behavior management approaches that strengthen self-regulatory functioning and adaptive coping mechanisms (Davydov et al., 2021; Rezapour et al., 2024).

While self-control may explain how cognitive and emotional vulnerabilities influence behavior, motivational processes may influence the strength of these relationships. Self-Determination Theory proposes that autonomous motivation represents a high-quality form of motivation characterized by self-endorsed goals, personal values, and intrinsic interest. Individuals with elevated autonomous motivation are more likely to engage in adaptive self-regulation, persistence, and psychological well-being. Meta-analytic evidence has demonstrated robust associations between autonomous motivation and positive psychological outcomes across numerous domains of functioning (Ryan et al., 2022). Autonomous motivation may therefore serve as a protective factor that reduces the behavioral consequences of psychological vulnerabilities.

Recent studies have increasingly highlighted the significance of autonomous motivation in emotional and behavioral functioning. Research has shown that self-determination mediates relationships between mindfulness and perfectionism, indicating that autonomous motivation contributes to adaptive psychological regulation (Antunes et al., 2025). Theoretical perspectives further suggest that adolescents who act according to personally endorsed values are better able to regulate impulses, tolerate emotional discomfort, and resist engagement in maladaptive behaviors. Consequently, autonomous motivation may moderate the relationship between self-control and externalizing behaviors by strengthening the protective effects of self-regulatory capacities.

Despite growing evidence regarding the individual roles of maladaptive schemas, alexithymia, reward sensitivity, self-control, and autonomous motivation, relatively few studies have integrated these variables within a single comprehensive structural model. Existing investigations

have often focused on isolated relationships or specific clinical populations, limiting understanding of the complex interplay among cognitive vulnerabilities, emotional processing deficits, motivational tendencies, and self-regulatory mechanisms. Furthermore, adolescence represents a unique developmental period during which these processes may interact in particularly influential ways. Understanding these interactions is essential for developing prevention and intervention programs that target the underlying mechanisms of behavioral maladjustment.

Given these theoretical and empirical considerations, the present study aimed to develop and test a structural model of adolescents' externalizing behaviors based on early maladaptive schemas, alexithymia, and reward sensitivity, with the mediating role of self-control and the moderating role of autonomous motivation.

2. Methods and Materials

2.1. Study Design and Participants

This study employed a cross-sectional correlational design using structural equation modeling (SEM) to investigate the direct and indirect relationships among early maladaptive schemas, alexithymia, reward sensitivity, self-control, autonomous motivation, and externalizing behaviors in adolescents. The research population consisted of high school students enrolled in public and private secondary schools in Tehran, Iran, during the 2025–2026 academic year. A multistage cluster sampling method was used to ensure adequate representation of adolescents from different educational districts of the city. Initially, several educational districts were randomly selected, followed by the random selection of schools within each district. Subsequently, eligible students were invited to participate in the study after obtaining permission from school authorities and informed consent from both students and their parents.

A total of 620 adolescents participated in the study. The sample size was determined based on recommendations for structural equation modeling, which emphasize the necessity of large samples to achieve stable parameter estimates and sufficient statistical power when testing complex mediation and moderation models. Inclusion criteria included being between 14 and 18 years of age, enrollment in a secondary school in Tehran, the ability to comprehend and respond to the study questionnaires, and willingness to participate voluntarily. Students with severe cognitive impairments, diagnosed psychotic disorders, or incomplete questionnaire responses were excluded from the final analysis.

2.2. Measures

Externalizing behaviors were assessed using the Youth Self-Report (YSR) Externalizing Problems Scale developed by Achenbach and Rescorla (2001). This widely used instrument evaluates adolescents' behavioral problems manifested through aggressive behavior and rule-breaking behavior. The externalizing behavior subscale consists of 30 items rated on a three-point Likert scale ranging from 0 (not true) to 2 (very true or often true). Higher scores indicate greater levels of behavioral dysregulation, aggression, delinquent tendencies, and conduct-related problems. Previous studies conducted across different cultural contexts have reported satisfactory psychometric properties for the scale, including strong internal consistency, construct validity, and test-retest reliability. The Persian version of the instrument has also demonstrated acceptable reliability and validity among Iranian adolescent populations.

Early maladaptive schemas were measured using the Young Schema Questionnaire–Short Form (YSQ-S3) developed by Young (2005). The questionnaire consists of 90 items assessing 18 early maladaptive schemas grouped into five schema domains, including disconnection and rejection, impaired autonomy and performance, impaired limits, other-directedness, and over-vigilance and inhibition. Participants rate each statement on a six-point Likert scale ranging from 1 (completely untrue of me) to 6 (describes me perfectly). Higher scores indicate stronger endorsement of dysfunctional cognitive and emotional patterns formed during childhood and adolescence. The instrument has been extensively validated in clinical and non-clinical populations and has shown excellent internal consistency, convergent validity, and factorial validity. Previous Iranian studies have confirmed the reliability and validity of the Persian version for use with adolescents and young adults.

Alexithymia was assessed using the Toronto Alexithymia Scale-20 (TAS-20) developed by Bagby, Parker, and Taylor (1994). The TAS-20 is a self-report measure consisting of 20 items distributed across three dimensions: difficulty identifying feelings, difficulty describing feelings, and externally oriented thinking. Responses are recorded on a five-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree). Higher total scores reflect greater difficulties in emotional awareness, emotional expression, and emotional processing. The scale has been widely used in psychological research and has demonstrated strong psychometric characteristics, including adequate reliability, construct validity, and factorial stability. Studies conducted

in Iran have also supported the validity and reliability of the Persian adaptation of the TAS-20 among adolescent and adult samples.

Reward sensitivity was measured using the Sensitivity to Punishment and Sensitivity to Reward Questionnaire (SPSRQ) developed by Torrubia, Ávila, Moltó, and Caseras (2001). For the purposes of this study, the Sensitivity to Reward subscale was utilized to assess individual differences in responsiveness to rewarding stimuli and reward-seeking tendencies. The reward sensitivity subscale contains 24 dichotomous items scored as either “Yes” or “No.” Higher scores indicate stronger behavioral activation tendencies and greater motivation to pursue rewarding experiences. The questionnaire is grounded in Gray's Reinforcement Sensitivity Theory and has demonstrated satisfactory reliability and validity across various age groups. Previous psychometric investigations have supported the applicability of the instrument within Iranian populations.

Self-control was measured using the Self-Control Scale developed by Tangney, Baumeister, and Boone (2004). This instrument contains 36 items that assess the capacity to regulate impulses, emotions, behaviors, and attention. Participants respond to each statement using a five-point Likert scale ranging from 1 (not at all like me) to 5 (very much like me). The scale evaluates several aspects of self-regulatory functioning, including impulse control, healthy habits, self-discipline, reliability, and resistance to temptation. Higher scores indicate stronger self-regulatory abilities and greater behavioral control. Numerous studies have reported excellent psychometric properties for the scale, and the Persian version has demonstrated acceptable reliability and validity among Iranian adolescents and young adults.

Autonomous motivation was assessed using the Autonomous Motivation subscale derived from the Academic Self-Regulation Questionnaire (SRQ-A) developed by Ryan and Connell (1989). The instrument evaluates the extent to which adolescents engage in activities based on intrinsic interest, personal values, and self-endorsed goals rather than external pressures or rewards. The autonomous motivation dimension consists of 16 items rated on a five-point Likert scale ranging from 1 (not at all true) to 5 (very true). Higher scores indicate stronger autonomous regulation and greater internalization of behavioral goals. Previous research has demonstrated satisfactory reliability, construct validity, and predictive validity for the scale across adolescent populations. The

Persian version has also shown acceptable psychometric characteristics in educational and developmental research conducted in Iran.

2.3. Data Analysis

Data were analyzed using SPSS version 27 and AMOS version 26. Prior to the primary analyses, descriptive statistics including means, standard deviations, skewness, and kurtosis coefficients were calculated to examine the distributional properties of the variables. Pearson correlation coefficients were computed to assess bivariate relationships among the study variables. The assumptions of structural equation modeling, including multivariate normality, absence of multicollinearity, and adequacy of sample size, were examined before model estimation. Confirmatory factor analysis was performed to evaluate the measurement properties of the latent constructs. Subsequently, structural equation modeling was employed to test the hypothesized relationships among early maladaptive schemas, alexithymia, reward sensitivity, self-control, autonomous motivation, and externalizing behaviors. The mediating role of self-control was evaluated using bootstrapping procedures with 5,000 resamples and bias-corrected confidence intervals. The moderating effect of autonomous motivation was examined through latent interaction analysis

and multi-group structural modeling procedures. Model fit was assessed using multiple goodness-of-fit indices, including the chi-square statistic, comparative fit index (CFI), Tucker–Lewis index (TLI), goodness-of-fit index (GFI), normed fit index (NFI), standardized root mean square residual (SRMR), and root mean square error of approximation (RMSEA). Statistical significance was determined at the 0.05 level.

3. Findings and Results

A total of 620 adolescents participated in the study. The mean age of the participants was 16.24 years ($SD = 1.18$), ranging from 14 to 18 years. Of the total sample, 312 participants (50.3%) were female and 308 participants (49.7%) were male. Regarding educational level, 203 students (32.7%) were enrolled in the tenth grade, 208 students (33.5%) were enrolled in the eleventh grade, and 209 students (33.8%) were enrolled in the twelfth grade. The majority of participants reported living with both parents (85.5%), while the remaining participants lived in single-parent or alternative family arrangements. Preliminary examination of the data indicated no substantial missing values. Skewness and kurtosis values for all study variables were within acceptable ranges (± 2), indicating that the assumption of normality was adequately satisfied.

Table 1

Descriptive Statistics and Correlations Among Study Variables

Variable	Mean	SD	1	2	3	4	5	6
1. Externalizing Behaviors	41.28	11.64	1					
2. Early Maladaptive Schemas	274.73	52.18	.61**	1				
3. Alexithymia	56.92	10.47	.54**	.48**	1			
4. Reward Sensitivity	13.85	4.29	.46**	.31**	.28**	1		
5. Self-Control	104.71	17.53	-.65**	-.59**	-.52**	-.41**	1	
6. Autonomous Motivation	58.63	11.26	-.43**	-.38**	-.34**	-.22**	.57**	1

Table 1 presents the descriptive statistics and bivariate correlations among the study variables. The findings revealed that externalizing behaviors were positively associated with early maladaptive schemas ($r = .61, p < .01$), alexithymia ($r = .54, p < .01$), and reward sensitivity ($r = .46, p < .01$). Conversely, externalizing behaviors were negatively associated with self-control ($r = -.65, p < .01$) and autonomous motivation ($r = -.43, p < .01$). Early maladaptive schemas demonstrated significant positive relationships with

alexithymia and reward sensitivity and significant negative relationships with self-control and autonomous motivation. Furthermore, self-control was positively correlated with autonomous motivation ($r = .57, p < .01$). The magnitude and direction of these correlations were consistent with the proposed theoretical model and provided preliminary support for proceeding with structural equation modeling analyses.

Table 2

Measurement Model Fit Indices

Fit Index	Obtained Value	Recommended Value
χ^2/df	2.47	< 3.00
CFI	.95	$\geq .90$
TLI	.94	$\geq .90$
GFI	.93	$\geq .90$
NFI	.92	$\geq .90$
IFI	.95	$\geq .90$
RMSEA	.049	< .08
SRMR	.043	< .08

The adequacy of the measurement model was evaluated prior to testing the structural relationships among the latent variables. As shown in Table 2, all goodness-of-fit indices indicated an acceptable to excellent fit between the proposed measurement model and the observed data. The χ^2/df ratio was below the recommended threshold of 3.00, suggesting satisfactory model parsimony. Incremental fit indices, including the Comparative Fit Index (CFI = .95), Tucker–Lewis Index (TLI = .94), Incremental Fit Index (IFI = .95),

and Normed Fit Index (NFI = .92), all exceeded the recommended cutoff value of .90. Additionally, the RMSEA value of .049 and SRMR value of .043 were well below the maximum acceptable threshold of .08. Collectively, these findings indicated that the latent constructs were measured adequately and that the measurement model provided a strong foundation for testing the hypothesized structural model.

Figure 1

Structural Model of Externalizing Behaviors Based on Early Maladaptive Schemas, Alexithymia, and Reward Sensitivity with the Mediating Role of Self-Control and the Moderating Role of Autonomous Motivation

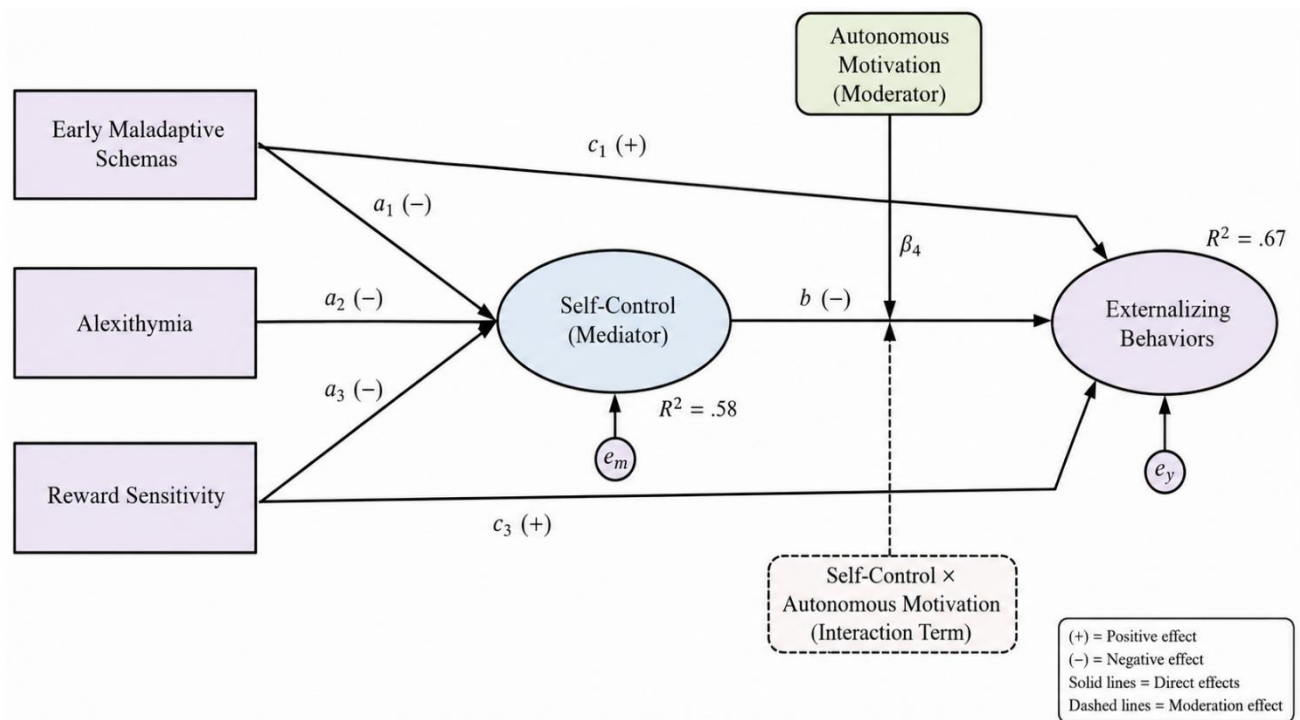


Table 3

Standardized Direct Effects in the Structural Model

Path	β	SE	CR	p
Early Maladaptive Schemas → Externalizing Behaviors	.31	.04	6.84	< .001

Alexithymia → Externalizing Behaviors	.22	.05	4.92	< .001
Reward Sensitivity → Externalizing Behaviors	.18	.04	4.15	< .001
Early Maladaptive Schemas → Self-Control	-.41	.04	-8.26	< .001
Alexithymia → Self-Control	-.26	.05	-5.73	< .001
Reward Sensitivity → Self-Control	-.17	.04	-3.98	< .001
Self-Control → Externalizing Behaviors	-.39	.04	-8.84	< .001
Autonomous Motivation → Externalizing Behaviors	-.15	.04	-3.51	< .001

The structural model analysis demonstrated that all hypothesized direct paths were statistically significant. Early maladaptive schemas emerged as the strongest positive predictor of externalizing behaviors ($\beta = .31, p < .001$), followed by alexithymia ($\beta = .22, p < .001$) and reward sensitivity ($\beta = .18, p < .001$). These findings indicate that adolescents who experience more pervasive maladaptive cognitive schemas, greater difficulties in identifying and expressing emotions, and heightened sensitivity to rewarding stimuli tend to exhibit higher levels of aggressive, impulsive, and rule-breaking behaviors. In addition, all three predictor variables significantly and negatively predicted

self-control. Early maladaptive schemas exerted the strongest negative influence on self-control ($\beta = -.41, p < .001$), suggesting that dysfunctional cognitive-emotional structures substantially impair adolescents' capacity for behavioral regulation. Self-control itself demonstrated a strong negative association with externalizing behaviors ($\beta = -.39, p < .001$), highlighting its central role as a protective factor. Autonomous motivation also showed a significant negative direct effect on externalizing behaviors ($\beta = -.15, p < .001$), indicating that adolescents who engage in behaviors based on personal values and intrinsic goals exhibit lower levels of behavioral problems.

Table 4

Bootstrapping Results for Indirect and Moderating Effects

Effect	β	Boot LLCI	Boot ULCI	Result
Early Maladaptive Schemas → Self-Control → Externalizing Behaviors	.16	.11	.22	Significant
Alexithymia → Self-Control → Externalizing Behaviors	.10	.06	.15	Significant
Reward Sensitivity → Self-Control → Externalizing Behaviors	.07	.03	.11	Significant
Autonomous Motivation × Self-Control → Externalizing Behaviors	-.12	-.19	-.06	Significant

Bootstrapping analyses based on 5,000 resamples were conducted to evaluate the mediating role of self-control and the moderating role of autonomous motivation. As shown in Table 4, the indirect effect of early maladaptive schemas on externalizing behaviors through self-control was statistically significant ($\beta = .16, 95\% \text{ CI } [.11, .22]$). Similarly, self-control significantly mediated the relationship between alexithymia and externalizing behaviors ($\beta = .10, 95\% \text{ CI } [.06, .15]$) and the relationship between reward sensitivity and externalizing behaviors ($\beta = .07, 95\% \text{ CI } [.03, .11]$). Because none of the confidence intervals included zero, all mediation effects were considered statistically significant. These findings suggest that adolescents characterized by maladaptive schemas, emotional processing deficits, and elevated reward sensitivity are more likely to develop externalizing behaviors partly because these characteristics undermine their capacity for self-regulation and impulse control.

The moderation analysis further revealed a significant interaction effect between autonomous motivation and self-control on externalizing behaviors ($\beta = -.12, 95\% \text{ CI } [-.19, -$

.06]). This result indicates that the protective effect of self-control against externalizing behaviors was stronger among adolescents with higher levels of autonomous motivation. In practical terms, adolescents who possessed both strong self-control abilities and high autonomous motivation exhibited the lowest levels of externalizing behaviors, whereas those with low autonomous motivation benefited less from self-control capacities. The final structural model accounted for 58% of the variance in self-control and 67% of the variance in externalizing behaviors, indicating substantial explanatory power and strong empirical support for the proposed theoretical framework.

4. Discussion and Conclusion

The present study aimed to examine a structural model of adolescents' externalizing behaviors based on early maladaptive schemas, alexithymia, and reward sensitivity, with the mediating role of self-control and the moderating role of autonomous motivation. The findings demonstrated that early maladaptive schemas, alexithymia, and reward

sensitivity were significant positive predictors of externalizing behaviors. Furthermore, self-control significantly mediated the relationships between these variables and externalizing behaviors, while autonomous motivation moderated the relationship between self-control and externalizing behaviors. Overall, the proposed structural model demonstrated substantial explanatory power, accounting for a considerable proportion of variance in both self-control and externalizing behaviors. These findings support multidimensional models of adolescent psychopathology that emphasize the interaction of cognitive, emotional, motivational, and self-regulatory processes in the emergence of behavioral difficulties.

One of the most important findings of the present study was the significant positive relationship between early maladaptive schemas and externalizing behaviors. Adolescents who reported stronger maladaptive schemas exhibited higher levels of aggression, rule-breaking behaviors, impulsivity, and behavioral dysregulation. This finding is theoretically consistent with schema theory, which proposes that maladaptive schemas shape how individuals interpret social experiences, regulate emotions, and respond to environmental challenges. Adolescents who hold schemas related to mistrust, abandonment, emotional deprivation, insufficient self-control, or entitlement may be more likely to perceive interpersonal situations as threatening or unfair and consequently respond through aggressive or oppositional behaviors. The present finding aligns with previous research demonstrating that maladaptive schemas contribute to emotional and behavioral maladjustment across developmental stages (Inchausti et al., 2025; Pilkington et al., 2023). Similarly, Estévez et al. reported that maladaptive schemas play a significant role in predicting dysfunctional emotional and behavioral outcomes, particularly when accompanied by emotional regulation difficulties (Estévez et al., 2023). Farahi et al. further demonstrated that maladaptive schemas influence psychological functioning through their associations with emotional processing deficits and maladaptive coping mechanisms (Farahi et al., 2023). Taken together, these findings suggest that maladaptive schemas constitute enduring vulnerability factors that increase adolescents' susceptibility to externalizing behavior patterns.

The findings also revealed that alexithymia significantly predicted externalizing behaviors. Adolescents who experienced greater difficulties identifying and expressing emotions reported higher levels of behavioral problems. This result is consistent with the conceptualization of

alexithymia as a deficit in emotional awareness and emotional processing. When adolescents are unable to recognize, label, and communicate emotional experiences effectively, emotional distress may be expressed behaviorally through aggression, impulsive actions, and other externalizing manifestations. Emotional experiences that remain poorly understood are less likely to be regulated adaptively and more likely to be discharged through action-oriented responses. This interpretation is supported by previous research demonstrating significant associations between alexithymia and various forms of psychopathology and maladaptive behavior (Gao et al., 2025; Pace et al., 2022). Moreover, studies examining adolescent aggression have shown that alexithymia functions as a central mechanism linking adverse developmental experiences to aggressive behavior (Duan et al., 2025; M. Zhang et al., 2025). Similar findings have been reported in studies investigating trauma, psychological distress, and emotional maladjustment among adolescents and young adults (X. Zhang et al., 2025; Zhang et al., 2022). Therefore, the present findings reinforce the view that emotional awareness and emotional communication are essential protective factors against the development of externalizing behavioral tendencies.

Another important finding was the significant positive association between reward sensitivity and externalizing behaviors. Adolescents with higher levels of reward sensitivity demonstrated increased behavioral problems, suggesting that heightened responsiveness to rewarding stimuli may contribute to impulsive and risk-oriented behavior. According to reinforcement sensitivity theory, individuals characterized by elevated reward sensitivity are strongly motivated to pursue immediate rewards and pleasurable experiences, often with insufficient consideration of long-term consequences. During adolescence, developmental changes in neural reward systems may further intensify these tendencies. Consequently, highly reward-sensitive adolescents may be more vulnerable to aggressive conduct, sensation seeking, rule-breaking behaviors, and other externalizing manifestations. This finding is consistent with previous research demonstrating that reward sensitivity contributes to addictive behaviors, problematic internet use, excessive exercise, and behavioral dysregulation (Lyvers et al., 2025; Tagliaferri et al., 2025). Studies by Lyvers and colleagues also showed that reward sensitivity interacts with emotional processing difficulties to predict maladaptive behavioral outcomes (Lyvers, Kelahroodi, et al., 2022; Lyvers,

Truncali, et al., 2022). Therefore, reward sensitivity appears to represent an important motivational pathway through which adolescents become vulnerable to externalizing behavioral problems.

The study further demonstrated that early maladaptive schemas, alexithymia, and reward sensitivity were all significantly associated with lower levels of self-control. These findings suggest that cognitive vulnerabilities, emotional processing deficits, and heightened reward responsiveness undermine adolescents' capacity for self-regulation. Adolescents with maladaptive schemas may experience distorted interpretations of social situations that interfere with adaptive behavioral regulation. Likewise, adolescents with alexithymia may struggle to regulate emotional responses because they lack sufficient awareness of their emotional states. Similarly, adolescents characterized by heightened reward sensitivity may experience difficulties delaying gratification and resisting impulsive urges. Collectively, these factors can weaken self-regulatory functioning and increase susceptibility to behavioral problems. These interpretations are consistent with contemporary developmental models emphasizing the central role of executive functioning and cognitive control processes in adolescent adjustment (Dorjee, 2024; Elvin et al., 2024). Moreover, research examining aggression and behavioral dysregulation has identified executive function deficits as critical mechanisms linking developmental risk factors to maladaptive outcomes (M. Zhang et al., 2025).

One of the most significant contributions of the present study was the confirmation of the mediating role of self-control. The findings indicated that self-control partially mediated the effects of early maladaptive schemas, alexithymia, and reward sensitivity on externalizing behaviors. In other words, these risk factors contributed to behavioral problems partly because they impaired adolescents' capacity for self-regulation. This finding is particularly important because it identifies a modifiable psychological mechanism that may serve as a target for preventive and therapeutic interventions. Self-control enables individuals to inhibit inappropriate impulses, regulate emotional reactions, delay immediate gratification, and act in accordance with long-term goals. When self-control is weakened, adolescents become more vulnerable to impulsive, aggressive, and socially inappropriate behaviors. The current findings support theoretical perspectives suggesting that self-regulation functions as a central pathway through which diverse psychological vulnerabilities influence behavioral outcomes (Elvin et al.,

2024; Wen, 2023). Furthermore, neuroscience-informed prevention frameworks emphasize the importance of strengthening self-regulatory capacities to reduce risk behaviors among youth (Rezapour et al., 2024). Evidence from behavior management interventions has similarly demonstrated that enhancing self-regulation can lead to substantial improvements in emotional and behavioral functioning (Davydov et al., 2021).

The mediating role of self-control can also be understood within broader neuropsychological frameworks involving interoception and emotional awareness. Previous research has suggested that alexithymia often emerges from deficits in interoceptive processing, which subsequently impair emotional regulation and behavioral control (Bonaz et al., 2021; Brewer et al., 2021). Studies investigating autism spectrum traits, somatic disorders, and addictive behaviors have similarly identified alexithymia as a mechanism connecting interoceptive dysfunction to emotional and behavioral difficulties (Lyvers & Thorberg, 2023; Zdankiewicz-Ścigala et al., 2021). Thus, the present findings may reflect a broader process in which cognitive and emotional vulnerabilities undermine self-regulatory functioning, thereby increasing the likelihood of externalizing behaviors.

Another notable finding concerned the moderating role of autonomous motivation. The results indicated that autonomous motivation strengthened the protective influence of self-control on externalizing behaviors. Specifically, adolescents who exhibited both high self-control and high autonomous motivation demonstrated the lowest levels of externalizing behaviors. This finding is consistent with Self-Determination Theory, which proposes that autonomous motivation facilitates adaptive functioning by promoting behavior that is aligned with personal values, interests, and goals (Ryan et al., 2022). When adolescents act out of autonomous rather than externally imposed motives, they may experience greater psychological integration, persistence, and self-regulation. Consequently, self-control may become more effective because behavioral regulation is supported by internalized values rather than external pressures.

The moderating effect of autonomous motivation is further supported by recent empirical findings. Antunes et al. demonstrated that self-determination processes play a significant role in adaptive psychological functioning and contribute to healthier patterns of self-regulation (Antunes et al., 2025). Adolescents characterized by higher autonomous motivation are more likely to engage in reflective decision-

making, resist impulsive temptations, and maintain behaviors consistent with long-term personal goals. Therefore, autonomous motivation appears to function as an important resilience factor that enhances the effectiveness of self-control and reduces the behavioral consequences of cognitive and emotional vulnerabilities.

Taken together, the findings of the present study support integrative models of adolescent psychopathology that emphasize the interaction of cognitive, emotional, motivational, and self-regulatory processes. The results suggest that externalizing behaviors do not emerge solely from maladaptive schemas, emotional deficits, or reward sensitivity. Rather, these risk factors exert their influence through interconnected pathways involving self-regulatory capacities and motivational resources. Adolescents who possess maladaptive schemas, experience difficulties understanding emotions, and demonstrate heightened responsiveness to rewards may be particularly vulnerable to behavioral problems when self-control is weak and autonomous motivation is low. Conversely, strong self-control and autonomous motivation appear to provide substantial protection against behavioral maladjustment. These findings contribute to the growing literature emphasizing the importance of multidimensional prevention and intervention approaches that address not only behavioral symptoms but also the underlying cognitive, emotional, and motivational mechanisms that sustain them.

Several limitations should be considered when interpreting the findings of the present study. First, the cross-sectional design prevents definitive conclusions regarding causal relationships among the variables. Although the proposed structural model was theoretically grounded, longitudinal research is necessary to establish temporal ordering among maladaptive schemas, alexithymia, reward sensitivity, self-control, autonomous motivation, and externalizing behaviors. Second, all variables were assessed using self-report measures, which may have increased the possibility of response biases, social desirability effects, and shared method variance. Third, the study sample consisted exclusively of adolescents from Tehran, which may limit the generalizability of the findings to adolescents from other cultural, geographical, or socioeconomic backgrounds. Finally, additional psychological, familial, and environmental variables that may influence externalizing behaviors were not included in the model.

Future studies should employ longitudinal and prospective designs to clarify the developmental pathways linking cognitive vulnerabilities, emotional processing

deficits, motivational tendencies, and behavioral outcomes across adolescence. Researchers may also examine the proposed model among different age groups, cultural contexts, and clinical populations to determine its generalizability. Further investigations could incorporate additional variables such as parenting styles, peer relationships, attachment patterns, executive functioning, resilience, and school climate to develop more comprehensive explanatory models. Experimental and intervention-based studies are also needed to determine whether enhancing self-control and autonomous motivation can reduce the impact of maladaptive schemas, alexithymia, and reward sensitivity on externalizing behaviors.

The findings of the present study highlight the importance of designing prevention and intervention programs that simultaneously address cognitive, emotional, motivational, and self-regulatory processes. School counselors, psychologists, and mental health professionals should consider incorporating schema-focused interventions, emotional awareness training, and self-control enhancement strategies into adolescent mental health programs. Educational initiatives that foster autonomous motivation by supporting students' psychological needs for autonomy, competence, and relatedness may further reduce behavioral difficulties. In addition, parents and educators can play a crucial role by creating supportive environments that encourage emotional expression, adaptive coping, responsible decision-making, and the development of long-term self-regulatory skills. Such multidimensional approaches may contribute substantially to reducing externalizing behaviors and promoting healthy adolescent development.

Authors' Contributions

All authors significantly contributed to this study.

Declaration

In order to correct and improve the academic writing of our paper, we have used the language model ChatGPT.

Transparency Statement

Data are available for research purposes upon reasonable request to the corresponding author.

Acknowledgments

We hereby thank all individuals for participating and cooperating us in this study.

Declaration of Interest

The authors report no conflict of interest.

Funding

According to the authors, this article has no financial support.

Ethical Considerations

In this study, to observe ethical considerations, participants were informed about the goals and importance of the research before the start of the study and participated in the research with informed consent.

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