Structural Equation Modeling of Addiction Proneness in Male High School Students Based on Parental Emotional Tone and Cognitive Bias with the Mediating Role of Coherent Self-Knowledge

Sabina. Nobari[1], Mansour Ali. Mahdi[2], Mahtab. Moraveji[3*], Mehrdad. Sabet[4], Amin. Rafiepoor[5]

[1] PhD Student, Department of Clinical Psychology, Ki.C, Islamic Azad University, Kish, Iran
[2] Department of Psychology, TeMS.C., Islamic Azad University, Tehran, Iran
[3] Department of Nursing & Midwifery, Za.c., Islamic Azad University, Zanjan, Iran
[4] Department of psychology, Ro.C., Islamic Azad University, Roudehen, Iran
[5] Department of Psychology, Payame Noor University, Tehran, Iran

* **Corresponding author email address**: mahtab.moraveji@iau.ac.ir

A r t i c l e   I n f o

A B S T R A C T

Objective: The objective of this study was to examine the structural relationships between parental emotional tone and cognitive bias with addiction proneness in male high school students, considering the mediating role of integrative self-knowledge.

Methods and Materials: This correlational study employed a structural equation modeling design. The statistical population included male high school students in Tehran during the 2024–2025 academic year, from whom 590 participants were selected through convenience sampling. Data were collected using the Addiction Proneness Questionnaire, Family Emotional Expressiveness Questionnaire, Cognitive Bias Questionnaire, and Integrative Self-Knowledge Questionnaire. Data analysis was conducted using SPSS 26 and AMOS 26. Model fit was evaluated using χ^2/df, RMSEA, CFI, GFI, AGFI, NFI, IFI, and SRMR indices. Indirect effects were tested using the bootstrap method.

Findings: Positive parental emotional expressiveness had a significant positive effect on integrative self-knowledge ($\beta = 0.38$, $p < .001$) and a significant negative direct effect on addiction proneness ($\beta = -0.18$, $p < .001$). Negative parental emotional expressiveness ($\beta = 0.24$, $p < .001$) and cognitive bias ($\beta = 0.21$, $p < .001$) showed significant positive direct effects on addiction proneness, while both negatively predicted integrative self-knowledge ($\beta = -0.31$ and $\beta = -0.29$, respectively, $p < .001$). Integrative self-knowledge significantly reduced addiction proneness ($\beta = -0.36$, $p < .001$) and mediated the relationships between parental emotional tone, cognitive bias, and addiction proneness. The model explained 52% of the variance in addiction proneness and 41% of the variance in integrative self-knowledge, with satisfactory goodness-of-fit indices (χ^2/df = 2.18, RMSEA = 0.052, CFI = 0.94).

Conclusion: The findings highlight integrative self-knowledge as a central protective mechanism through which emotional family environments and cognitive processing patterns shape adolescents' vulnerability to addiction.

Keywords: addiction proneness, parental emotional tone, cognitive bias, coherent self-knowledge, students

1. Introduction

Adolescence represents a critical developmental stage characterized by profound biological, psychological, and social transformations that jointly increase vulnerability to maladaptive behaviors, including substance use and behavioral addictions. During this period, the maturation of cognitive control systems, emotional regulation processes, and social identity formation occurs simultaneously with heightened sensitivity to environmental influences and stressors (Howard, 2024; Silvers, 2022). This developmental convergence places adolescents at heightened risk for experimenting with substances, developing addictive tendencies, and engaging in impulsive behaviors that may compromise long-term mental health and social functioning. Empirical evidence indicates that adolescence constitutes a sensitive window in which environmental, familial, and cognitive factors interact dynamically to shape risk trajectories for addiction (Bogdan et al., 2023; Marceau, 2023).

Addiction proneness is increasingly conceptualized as a multidimensional vulnerability profile reflecting the interaction between genetic predispositions, neurobiological mechanisms, psychological processes, and social contexts (Bogdan et al., 2023). Contemporary models emphasize that addiction is not merely the consequence of substance exposure but rather the product of complex developmental cascades involving emotion regulation, cognitive processing, social learning, and environmental feedback loops (Bogdan et al., 2023; Marceau, 2023). Within this framework, early emotional environments and cognitive vulnerabilities emerge as central contributors to the formation of addiction-related risk long before actual substance use behaviors are established.

Parental emotional tone constitutes one of the most powerful and persistent environmental influences shaping adolescent psychological development. Parental warmth, emotional expressiveness, hostility, and emotional availability systematically influence children's emotional competence, attachment security, cognitive development, and behavioral adjustment (Lanjekar et al., 2022; Mortazavizadeh et al., 2022). Longitudinal and developmental studies consistently demonstrate that emotionally supportive parenting fosters adaptive emotion regulation, resilience, and healthy coping, whereas emotionally hostile or inconsistent parenting increases vulnerability to internalizing and externalizing disorders (Dmitrieva & Espel, 2023; Nikstat & Riemann, 2022). These

parental influences extend into adolescence, shaping how young people interpret social experiences, regulate affect, and respond to stress (Marceau, 2023).

Recent research has further distinguished between positive parental emotional expressiveness—characterized by warmth, affection, and emotional validation—and negative parental emotional expressiveness, which includes criticism, hostility, and emotional withdrawal (Huang, 2024). Positive emotional parenting is associated with improved emotion regulation and psychological adjustment across childhood and adolescence, whereas negative emotional climates increase vulnerability to emotional dysregulation and behavioral risk (Huang, 2024; Mortazavizadeh et al., 2022). Importantly, exposure to chronic parental hostility and emotional inconsistency predicts later substance use and addictive tendencies, both directly and indirectly through maladaptive emotional and cognitive processes (Dmitrieva & Espel, 2023; Marceau, 2023).

Parallel to these environmental influences, cognitive processes play a critical role in the development of addiction vulnerability. Cognitive bias—defined as systematic distortions in information processing, interpretation, and judgment—shapes how individuals perceive stressors, social interactions, and potential rewards (Jala, 2023; Sareen, 2022). Cognitive biases such as negative interpretation bias, self-focused attention bias, and expectancy distortions have been implicated in a wide range of psychopathological outcomes, including depression, self-harm, impulsivity, and addictive behaviors (Han, 2024; Wang et al., 2022). Adolescents exhibiting stronger cognitive biases demonstrate heightened emotional reactivity, impaired decision-making, and greater susceptibility to maladaptive coping strategies (Chang, 2024; Dhakal & Lamsal, 2023).

Neurocognitive studies further reveal that cognitive biases are not merely behavioral tendencies but are grounded in measurable alterations within prefrontal-limbic circuits governing emotion regulation and reward processing (Chang, 2024; Wang et al., 2022). These neurocognitive vulnerabilities interact with environmental stressors and emotional climates, amplifying addiction risk during adolescence when neural plasticity and reward sensitivity are particularly pronounced (Bogdan et al., 2023; Silvers, 2022). Consequently, adolescents exposed to negative emotional environments and persistent cognitive distortions face compounded developmental risk.

While parental emotional tone and cognitive bias independently predict addiction vulnerability, emerging

evidence suggests that their impact may be mediated through higher-order self-regulatory constructs, particularly integrative self-knowledge. Integrative self-knowledge refers to the capacity to coherently integrate past experiences, present emotions, and future goals into a stable and meaningful sense of self (Bauer, 2024; Ramezani, 2024). This construct reflects an individual's ability to engage in reflective self-awareness, experiential self-awareness, and temporal integration of identity, thereby facilitating adaptive coping, emotional regulation, and psychological well-being (Bauer, 2024; Zhou et al., 2022).

Empirical research consistently demonstrates that higher levels of integrative self-knowledge are associated with greater psychological resilience, improved well-being, lower impulsivity, and reduced engagement in high-risk behaviors (Ramezani, 2024; Zhou et al., 2022). Conversely, deficits in integrative self-knowledge are linked to emotional instability, impulsive decision-making, and vulnerability to addictive behaviors (Muradian et al., 2025; Ramezani, 2024). Adolescence represents a particularly sensitive period for the development of self-coherence, as individuals actively construct identity frameworks through social feedback, emotional experiences, and cognitive reflection (Bauer, 2024; Howard, 2024).

Importantly, the development of integrative self-knowledge is deeply embedded within family emotional environments. Supportive parental emotional climates promote reflective processing, emotional awareness, and narrative integration, whereas hostile or invalidating environments undermine self-coherence and emotional stability (Dmitrieva & Espel, 2023; Mortazavizadeh et al., 2022). Simultaneously, cognitive biases distort self-interpretation and memory integration processes, further disrupting the formation of coherent self-knowledge (Han, 2024; Wang et al., 2022). Thus, integrative self-knowledge may function as a critical psychological mechanism linking environmental emotional contexts and cognitive vulnerabilities to addiction proneness.

Despite growing recognition of these interconnections, empirical models integrating parental emotional tone, cognitive bias, and integrative self-knowledge in the prediction of adolescent addiction vulnerability remain limited. Existing research often examines these factors in isolation or within narrow outcome frameworks, failing to capture their interactive and mediational dynamics across development (Bogdan et al., 2023; Marceau, 2023). Moreover, cultural and contextual variations in family dynamics, emotional expression, and adolescent development underscore the need for context-specific modeling, particularly within non-Western populations where familial relationships and emotional norms may differ substantially (Hosseini et al., 2022; Rafiee, 2023).

In Iran, epidemiological evidence indicates a concerning prevalence of substance use and addiction vulnerability among male adolescents (Hosseini et al., 2022). Socio-cultural pressures, academic stress, peer influence, and family emotional climates converge to create complex risk environments (Jayte et al., 2025; Rafiee, 2023). Studies further suggest that emotional suppression, limited parental communication, and cognitive distortions related to self-worth and social evaluation are particularly salient in shaping adolescent risk behaviors in this context (Amini, 2023; Rafiee, 2023). These patterns highlight the urgent need for integrative, developmentally informed models that clarify the psychological mechanisms underlying addiction proneness among Iranian adolescents.

The present study responds to this gap by proposing and empirically testing a structural model in which parental emotional tone (positive and negative emotional expressiveness) and cognitive bias predict addiction proneness in male high school students, with integrative self-knowledge serving as a mediating psychological mechanism. This framework is grounded in contemporary developmental, neurocognitive, and self-regulation theories emphasizing the interplay between emotional environments, cognitive processing, and identity integration in shaping behavioral outcomes (Bauer, 2024; Bogdan et al., 2023; Marceau, 2023).

By simultaneously modeling environmental emotional influences, cognitive vulnerabilities, and self-regulatory processes, the present research advances a more comprehensive understanding of adolescent addiction vulnerability. Furthermore, identifying integrative self-knowledge as a potential protective factor offers important implications for prevention and intervention programs targeting family communication patterns, cognitive restructuring, and self-development skills among adolescents (Howard, 2024; Ramezani, 2024; Zhou et al., 2022).

The aim of this study was to model the structural relationships of addiction proneness in male high school students based on parental emotional tone and cognitive bias, with the mediating role of integrative self-knowledge.

2. Methods and Materials

2.1. Study Design and Participants

The statistical population of the present study consisted of all male high school students in the city of Tehran during the 2024–2025 academic year; however, the exact population size was not available. Based on the recommendation of Bentler and Chou (1987) for structural equation modeling, an appropriate sample size was determined to be approximately 5 to 10 times the number of observed variables. Given that the total number of items was 136, the minimum required sample size was estimated at 680 participants (five times the number of items). The inclusion criteria consisted of being between 12 and 18 years of age and having no severe psychological disorders, whereas the exclusion criteria included incomplete questionnaire responses and unwillingness to participate in the study. Sampling was conducted using a convenience sampling method, and with the coordination of the Department of Education, the questionnaires were administered to the students.

2.2. Measures

Addiction Proneness Questionnaire. The Addiction Proneness Questionnaire was developed by Zeynali (2014) to assess vulnerability to addiction. This instrument consists of 50 items and 10 subscales, including internal dissatisfaction, risky behaviors, untrustworthiness, exhibitionism, positive attitudes toward substances, family dissatisfaction, low faith and spirituality, deviation from norms, self-centeredness, and risky peer relationships. Items are scored on a three-point Likert scale (1 = No, 2 = Yes–Somewhat, 3 = Yes–Very Much). Total scores range from 50 to 150, with higher scores indicating greater addiction proneness. Zeynali (2014) reported excellent internal consistency for this scale with a Cronbach's alpha coefficient of .98. Convergent validity of the instrument was reported as .62 with another measure of addiction proneness.

Family Emotional Expressiveness Questionnaire (EEQ). This questionnaire was developed by King and Emmons (1990) and contains 16 items across three components. Seven items assess positive emotional expressiveness (Items 1–7), five items assess intimacy expression (Items 8–12), and four items assess negative emotional expressiveness (Items 13–16). Responses are provided on a five-point Likert scale ranging from strongly disagree to strongly agree. Items 7, 8, and 9 are reverse scored. The minimum possible score

is 16 and the maximum possible score is 80. Scores between 16 and 32 indicate weak emotional expressiveness, scores between 32 and 54 indicate moderate emotional expressiveness, and scores above 54 indicate strong emotional expressiveness. Servaas et al. (1999) reported a Cronbach's alpha of .80 for this questionnaire. Barr et al. (2008) reported a Cronbach's alpha of .74, and Nils et al. (2014) reported a Cronbach's alpha of .77. In Iran, Rafiei et al. (2006) evaluated the psychometric properties of this scale and reported Cronbach's alpha coefficients of .68 for the total scale, .65 for positive emotional expressiveness, .59 for intimacy expression, and .68 for negative emotional expressiveness.

Cognitive Bias Questionnaire. This 10-item questionnaire was developed by Woody et al. (1997) and consists of two five-item subscales: self-focused bias (Items 1–5) and externally focused bias (Items 6–10). Participants respond to each item based on their perception of previous social interactions. Each item is rated on a five-point scale indicating the extent to which the participant's cognition corresponds with the statement. Each item is scored from 1 to 5, yielding a total score range of 10 to 50. Higher scores indicate greater levels of cognitive bias. In an Iranian sample, Cronbach's alpha coefficients of .76 and .72 were reported for the self-focused and externally focused subscales, respectively. Construct validity assessed through principal component analysis with varimax rotation indicated that these two subscales together accounted for 55.85% of the variance in cognitive bias.

Coherent Self-Knowledge Questionnaire (ISKQ). The Coherent Self-Knowledge Questionnaire was developed and validated by Ghorbani et al. (2008). This self-report instrument is designed to assess the construct of coherent self-knowledge and consists of 12 closed-ended items. Responses are recorded on a five-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree). The scale is structured to quantitatively measure the degree of agreement or disagreement with each statement, such that a score of 1 indicates the lowest level of agreement and a score of 5 indicates the highest level of agreement. This questionnaire measures three core dimensions of coherent self-knowledge: reflective self-awareness (Items 3, 6, 9), experiential self-awareness (Items 1, 5, 7, 8), and integration of past and present experiences to construct a desirable future (Items 2, 4, 10, 11, 12). Each dimension is assessed by a set of items, and the individual's total score on each dimension reflects the level of coherent self-knowledge in that domain. Total scores range from 12 to 60. Scores from 12 to 24 indicate

low levels of the construct, scores from 25 to 36 indicate moderate levels, and scores above 36 indicate high levels of coherent self-knowledge. Ghorbani et al. (2008) reported Cronbach's alpha coefficients ranging from .84 to .90 for this instrument, indicating high reliability. Additionally, the validity of the instrument, assessed through correlations among subscales, was reported as .84. Ghorbani et al. (2008) also reported a Cronbach's alpha of .82 for the short version of this questionnaire (12 items) in an Iranian sample. Concurrent validity was supported by a correlation of .56 with the Rosenberg Self-Esteem Scale (1989), indicating satisfactory validity of the instrument in the Iranian population.

2.3. Data Analysis

Data analysis involved both descriptive and inferential statistics. In the descriptive section, demographic characteristics as well as the means and standard deviations of participants' scores were examined. In the inferential section, direct and indirect relationships among variables were analyzed using structural equation modeling. Statistical assumptions, including data normality (Kolmogorov–Smirnov test) and multicollinearity (Durbin–Watson test, Variance Inflation Factor, and tolerance coefficient), were assessed. Data were analyzed using SPSS version 26 and AMOS version 26.

3. Findings and Results

The data collected from 590 students were analyzed using standardized questionnaires, and prior to hypothesis testing, descriptive results including demographic characteristics and study variables were examined. The findings indicated that the highest frequency belonged to the 16-year-old age group with 210 participants (35.6%), and the lowest frequency belonged to the 15-year-old group with 65 participants (11.0%), reflecting the predominance of the middle adolescent age group in the sample. Regarding cigarette use history, 95 students (16.1%) reported having smoked, whereas 495 students (83.9%) reported no history of smoking. Most students (480 individuals, 81.4%) were living with their parents, and the smallest proportion (10 individuals, 1.7%) were under the guardianship of relatives. In addition, 140 students (23.7%) reported a family history of addiction, and the majority of students (380 individuals, 64.4%) lived in families with moderate socioeconomic status. Examination of parental education levels revealed that the highest educational attainment corresponded to lower and upper secondary education (270 individuals, 45.8%), while the lowest level corresponded to illiterate parents (25 individuals, 4.2%). These findings provide a framework for analyzing the structural relationships among the study variables and for testing the proposed model hypotheses. Descriptive indices of the study variables, including means and standard deviations, are presented in Table 1.

Table 1

Descriptive Statistics of the Study Variables

Variable / Subscale	Theoretical Min	Theoretical Max	Observed Min	Observed Max	Mean	SD
Addiction Proneness (Total)	0	50	5	48	26.45	8.25
Internal Dissatisfaction	0	8	0	8	4.10	1.85
Risky Behaviors	0	6	0	6	3.25	1.40
Untrustworthiness	0	6	0	6	2.85	1.55
Exhibitionism	0	5	0	5	2.10	1.20
Positive Thoughts	0	3	0	3	1.20	0.80
Family Dissatisfaction	0	3	0	3	1.35	0.90
Faith and Spirituality	0	5	0	5	2.50	1.05
Deviation from Norms	0	5	0	5	2.80	1.15
Self-Centeredness	0	4	0	4	1.90	0.95
Risky Peer Relationships	0	5	0	5	2.40	1.10
Emotional Expressiveness (Total)	16	80	20	78	48.20	9.15
Positive Emotional Expressiveness	7	35	9	34	21.70	4.50
Intimacy Expression	5	25	6	24	14.80	3.20
Negative Emotional Expressiveness	4	20	5	19	11.70	2.80
Cognitive Bias (Total)	10	50	12	48	29.70	7.10
Self-Focused Bias	5	25	6	24	15.10	3.80
Externally Focused Bias	5	25	5	23	14.60	3.70
Coherent Self-Knowledge (Total)	12	60	15	58	35.60	6.90
Reflective Self-Awareness	3	15	4	14	9.50	2.10
Experiential Self-Awareness	4	20	5	20	12.80	2.85
Integration of Past and Present Experiences	5	20	6	19	13.30	3.20

The descriptive results indicate that the mean total score of addiction proneness among students (26.45 out of 50) is approximately at the theoretical midpoint, suggesting a moderate level of addiction proneness in the sample. Among the addiction proneness subscales, internal dissatisfaction (4.10 out of 8) and risky behaviors (3.25 out of 6) demonstrated the highest ratios of mean to theoretical maximum, indicating the relative prominence of these dimensions in the sample. For parental emotional expressiveness, the overall mean score (48.20 out of 80) was slightly above the theoretical midpoint, with positive emotional expressiveness (21.70 out of 35) and intimacy expression (14.80 out of 25) reflecting relatively favorable conditions, whereas negative emotional expressiveness (11.70 out of 20) remained at a moderate level. The mean cognitive bias score (29.70 out of 50) indicates a moderate level of this construct, with the self-focused and externally focused dimensions showing nearly equivalent mean scores. Finally, the mean coherent self-knowledge score (35.60 out of 60) was slightly above the theoretical midpoint, suggesting a moderately high level of this protective factor among students. The obtained standard deviations further indicate adequate variability and dispersion of scores across all variables, thereby supporting the suitability of the data for correlational analyses and structural equation modeling.

Table 2

Structural Model Fit Indices

Index	Observed Value	Acceptable Range	Status
χ^2/df	2.18	< 3	Good
RMSEA	0.052	< 0.08	Good
CFI	0.94	> 0.90	Good
GFI	0.92	> 0.90	Good
AGFI	0.89	> 0.85	Good
NFI	0.91	> 0.90	Good
IFI	0.94	> 0.90	Good
SRMR	0.048	< 0.08	Good

The model fit indices indicate that the proposed structural model demonstrates an adequate and satisfactory fit to the data, and that the empirical data are highly consistent with the theoretical model. The RMSEA value of 0.052 and the CFI value of 0.94 further confirm the adequacy of the model in explaining the relationships among the study variables.

Table 3

Direct Path Coefficients in the Structural Model

Path	Standardized Coefficient (β)	Standard Error	Critical Ratio (C.R.)	Significance Level
Positive Emotional Expressiveness → Coherent Self-Knowledge	0.38	0.062	6.13	< .001
Negative Emotional Expressiveness → Coherent Self-Knowledge	−0.31	0.058	−5.34	< .001
Cognitive Bias → Coherent Self-Knowledge	−0.29	0.055	−5.27	< .001
Positive Emotional Expressiveness → Addiction Proneness	−0.18	0.051	−3.53	< .001
Negative Emotional Expressiveness → Addiction Proneness	0.24	0.054	4.44	< .001
Cognitive Bias → Addiction Proneness	0.21	0.049	4.29	< .001
Coherent Self-Knowledge → Addiction Proneness	−0.36	0.059	−6.10	< .001

All direct paths were statistically significant at the .001 level. Coherent self-knowledge, with a path coefficient of −0.36, emerged as the strongest direct predictor of addiction proneness, whereas positive parental emotional expressiveness, with a coefficient of 0.38, exerted the greatest effect on enhancing coherent self-knowledge.

Table 4

Indirect Effects of Variables on Addiction Proneness with the Mediating Role of Coherent Self-Knowledge

Indirect Path	Indirect Effect Coefficient	Bootstrap Standard Error	95% Confidence Interval	Significance Level
Positive Emotional Expressiveness → Coherent Self-Knowledge → Addiction Proneness	−0.137	0.028	[−0.194, −0.086]	< .001
Negative Emotional Expressiveness → Coherent Self-Knowledge → Addiction Proneness	0.112	0.024	[0.068, 0.162]	< .001
Cognitive Bias → Coherent Self-Knowledge → Addiction Proneness	0.104	0.022	[0.064, 0.150]	< .001

The results of the bootstrap analysis indicate that coherent self-knowledge plays a statistically significant mediating role in the relationship between parental emotional tone and cognitive bias with addiction proneness. Because zero does not fall within any of the confidence intervals, all indirect effects are significant at the .05 level.

Table 5

Comparison of Direct, Indirect, and Total Effects on Addiction Proneness

Predictor Variable	Direct Effect	Indirect Effect	Total Effect
Positive Parental Emotional Expressiveness	−0.18	−0.137	−0.317
Negative Parental Emotional Expressiveness	0.24	0.112	0.352
Cognitive Bias	0.21	0.104	0.314
Coherent Self-Knowledge	−0.36	—	−0.360

Negative parental emotional expressiveness, with a total effect of 0.352, exerted the strongest detrimental influence on addiction proneness, whereas coherent self-knowledge, with a total effect of −0.360, functioned as the most powerful protective factor. The substantial proportion of the indirect effect relative to the total effect (approximately 40%) underscores the critical mediating role of coherent self-knowledge within the model.

Table 6

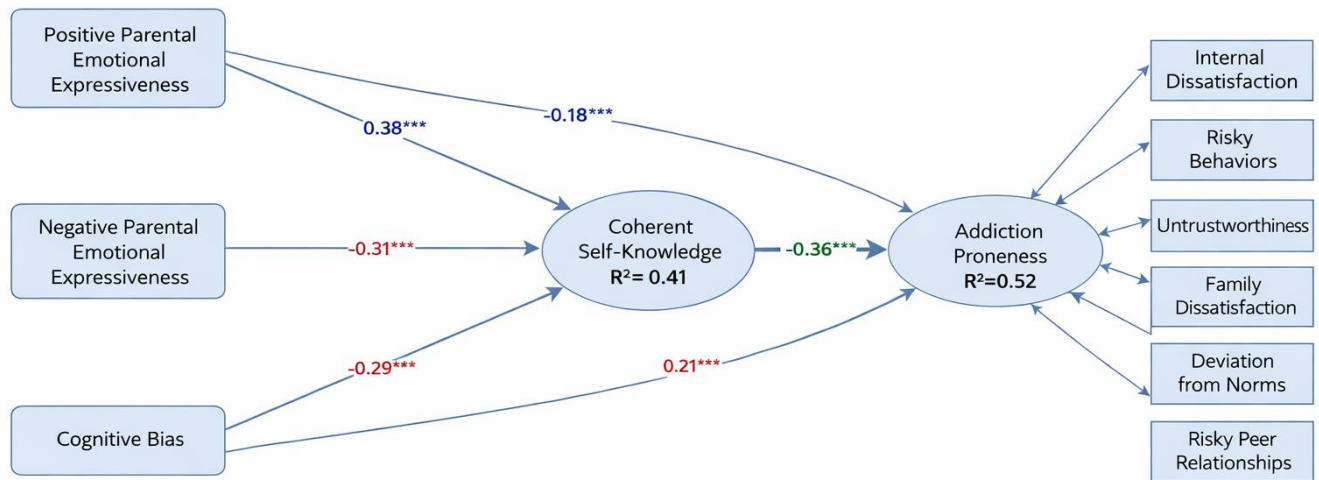*Coefficients of Determination (R²) for Endogenous Variables*

Endogenous Variable	R²	Percentage of Explained Variance
Coherent Self-Knowledge	0.41	41%
Addiction Proneness	0.52	52%

The structural model accounted for 52% of the variance in addiction proneness and 41% of the variance in coherent self-knowledge. These values indicate the satisfactory explanatory power of the proposed model in predicting students' addiction proneness.

Figure 1

Final Research Model

Fit Indices:
— χ^2/df = 2.118, RMSEA=0.052, CFI = 0.94, GFI=0.92
— **** p <.001

Direct paths:
— β.038*¹ — .031** — .1.61*** — 0.24*** — 0.001

4. Discussion

The present study aimed to clarify the structural relationships among parental emotional tone, cognitive bias, integrative self-knowledge, and addiction proneness in male high school students. The findings provide strong empirical support for the proposed model and confirm that both environmental emotional factors and cognitive vulnerabilities exert significant direct and indirect effects on adolescents' susceptibility to addictive tendencies. The final structural model demonstrated satisfactory goodness-of-fit indices, indicating that the hypothesized relationships among variables were consistent with the observed data. More importantly, integrative self-knowledge emerged as a central psychological mechanism through which both parental emotional tone and cognitive bias influenced addiction proneness.

The results revealed that positive parental emotional expressiveness exerted a significant protective effect on addiction proneness, both directly and indirectly through integrative self-knowledge. Adolescents who experienced higher levels of positive emotional expression from parents displayed stronger integrative self-knowledge, which in turn predicted lower addiction vulnerability. These findings are

consistent with developmental models emphasizing the foundational role of emotionally supportive parenting in shaping adaptive emotional regulation and identity development (Huang, 2024; Marceau, 2023; Mortazavizadeh et al., 2022). Positive emotional environments facilitate reflective processing, emotional awareness, and narrative coherence, all of which contribute to the development of integrative self-knowledge (Bauer, 2024). Through this pathway, adolescents acquire the capacity to regulate impulses, evaluate long-term consequences, and resist maladaptive coping strategies such as substance use.

Conversely, negative parental emotional expressiveness exerted the strongest detrimental effect on addiction proneness in the model. Adolescents exposed to higher levels of parental hostility, criticism, or emotional withdrawal showed weaker integrative self-knowledge and significantly higher addiction vulnerability. This pattern is consistent with prior evidence demonstrating that hostile and emotionally invalidating parenting disrupts emotion regulation, increases stress sensitivity, and undermines psychological adjustment (Dmitrieva & Espel, 2023; Nikstat & Riemann, 2022). Chronic exposure to negative emotional climates interferes with the adolescent's capacity to integrate emotional experiences coherently, thereby increasing

reliance on maladaptive coping mechanisms, including substance use and other addictive behaviors (Marceau, 2023; Muradian et al., 2025).

Cognitive bias also demonstrated significant direct and indirect effects on addiction proneness. Adolescents exhibiting higher levels of cognitive bias reported lower integrative self-knowledge and greater susceptibility to addiction. This finding aligns with extensive research linking cognitive distortions to maladaptive decision-making, emotional dysregulation, and risk-taking behaviors (Han, 2024; Jala, 2023; Sareen, 2022). Cognitive biases impair the individual's ability to accurately interpret social and emotional information, intensify negative affect, and promote impulsive behavioral responses (Dhakal & Lamsal, 2023). Neurocognitive evidence further suggests that such biases are associated with altered prefrontal–limbic functioning, thereby weakening regulatory control over reward-seeking behaviors (Chang, 2024; Wang et al., 2022). These mechanisms provide a plausible neuropsychological explanation for the observed association between cognitive bias and addiction proneness.

One of the most theoretically significant findings of this study is the mediating role of integrative self-knowledge. Integrative self-knowledge accounted for a substantial proportion of the indirect effects linking both parental emotional tone and cognitive bias to addiction proneness. Adolescents with stronger integrative self-knowledge were significantly less vulnerable to addiction, even in the presence of environmental and cognitive risk factors. This result is consistent with previous studies identifying integrative self-knowledge as a robust predictor of psychological well-being, emotional stability, and reduced impulsivity (Ramezani, 2024; Zhou et al., 2022). By enabling individuals to integrate past experiences, present emotions, and future goals into a coherent self-concept, integrative self-knowledge enhances self-regulation and reduces reliance on short-term reward-driven behaviors.

From a developmental perspective, adolescence is a period of heightened neuroplasticity, emotional sensitivity, and identity formation (Howard, 2024; Silvers, 2022). During this stage, family emotional climates and cognitive processing patterns exert amplified influence on self-construction processes (Bauer, 2024). The present findings indicate that integrative self-knowledge functions as a core developmental asset that buffers adolescents against addiction vulnerability by strengthening emotional regulation, enhancing reflective capacity, and stabilizing identity formation. This interpretation aligns with emerging

models emphasizing self-regulatory systems as critical mediators between environmental influences and behavioral outcomes (Bogdan et al., 2023; Marceau, 2023).

The magnitude of the explained variance further underscores the explanatory power of the proposed model. The structural model accounted for 52% of the variance in addiction proneness and 41% of the variance in integrative self-knowledge. These values exceed those typically reported in adolescent addiction research and highlight the central role of emotional and cognitive developmental processes in shaping addiction vulnerability (Bogdan et al., 2023; Hosseini et al., 2022). Particularly within the Iranian sociocultural context, where family relationships exert strong normative influence on adolescent development, the present model offers valuable insight into culturally embedded risk mechanisms (Amini, 2023; Rafiee, 2023).

The findings also have implications for the genetically informed neurobiology of addiction (GINA) model, which posits that genetic vulnerabilities are expressed through dynamic interactions with environmental and cognitive factors (Bogdan et al., 2023). The present results demonstrate that parental emotional tone and cognitive bias operate through integrative self-knowledge, thereby shaping behavioral phenotypes associated with addiction vulnerability. This supports the view that psychological self-regulatory mechanisms serve as key expression pathways for underlying neurobiological and genetic risk.

5. Conclusion

In summary, the present study advances a comprehensive developmental framework in which parental emotional tone and cognitive bias shape adolescent addiction vulnerability through their influence on integrative self-knowledge. This framework integrates emotional, cognitive, and identity-based processes into a unified explanatory model and provides a robust empirical foundation for targeted prevention and intervention strategies.

6. Limitations & Suggestions

Despite the strengths of the present study, several limitations should be acknowledged. The cross-sectional design precludes causal inferences regarding the directionality of relationships among variables. Reliance on self-report measures may also introduce response biases related to social desirability or recall. Furthermore, the sample was limited to male high school students in a single metropolitan area, which may restrict the generalizability of

findings to other age groups, females, or different cultural contexts.

Future studies should employ longitudinal designs to examine developmental trajectories and causal pathways linking parental emotional tone, cognitive bias, integrative self-knowledge, and addiction proneness across adolescence. Expanding samples to include female adolescents and diverse cultural contexts would enhance generalizability. Incorporating neurocognitive and physiological measures could further elucidate the biological mechanisms underlying these psychological processes.

Intervention programs should prioritize strengthening positive emotional communication within families, reducing hostile and invalidating parenting practices, addressing cognitive biases through targeted cognitive training, and fostering integrative self-knowledge development in adolescents through reflective, emotion-focused, and identity-based interventions within school and community settings.

Acknowledgments

We would like to express our appreciation and gratitude to all those who cooperated in carrying out 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.

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.

Funding

Authors' Contributions

S.N. developed the research concept, designed the study, and supervised the overall research process. M.M. coordinated data collection and contributed to measurement selection and field procedures. M.A. and M.S. conducted the statistical analyses, including structural equation modeling and interpretation of results. A.R. assisted with data management, literature review, and methodological refinement. All authors collaboratively contributed to the interpretation of findings, manuscript drafting and critical revision, approved the final version of the manuscript, and accept full responsibility for the accuracy and integrity of the work.

References

Amini, Z. (2023). Relation of social support status and social health in people with drug abuse. *Advanced Biomedical Research*, *12*(1), 63. https://doi.org/10.4103/abr.abr_85_21

Bauer, P. (2024). Development of self-derivation through memory integration and relations with world knowledge. https://doi.org/10.31234/osf.io/kuchf

Bogdan, R., Hatoum, A. S., Johnson, E. C., & Agrawal, A. (2023). The genetically informed neurobiology of addiction (GINA) model. *Nature Reviews Neuroscience*, *24*(1), 40-57. https://doi.org/10.1038/s41583-022-00656-8

Chang, M. (2024). Functional connectivity changes in the brain of adolescents with internet addiction: A systematic literature review of imaging studies. *PLOS Mental Health*, *1*(1), e0000022. https://doi.org/10.1371/journal.pmen.0000022

Dhakal, S., & Lamsal, R. (2023). Impact of cognitive biases on investment decisions of investors in Nepal. *The Lumbini Journal of Business and Economics*, *11*(1), 35-48. https://doi.org/10.3126/ljbe.v11i1.54315

Dmitrieva, J., & Espel, E. V. (2023). The role of paternal and maternal warmth and hostility on daughter's psychosocial outcomes: The insidious effects of father warmth combined with high paternal hostility. *Frontiers in psychology*, *14*, 930371. https://doi.org/10.3389/fpsyg.2023.930371

Han, X. (2024). The impact of negative cognitive bias on NSSI: Mediating non-adaptive cognitive emotion regulation strategies. *BMC Nursing*, *23*(1). https://link.springer.com/article/10.1186/s12912-024-02006-8

Hosseini, J., Shojaeefar, E., Pooladgar, P., Aliakbari, F., Ganji, M., Hamdieh, M., Kheradmand, A., & Fashami, M. A. (2022). Prevalence of substance use among Iranian male adolescents: Systematic review and meta-analysis. *Health Science Reports*, *5*(6), e885. https://doi.org/10.1002/hsr2.885

Howard, T. (2024). Navigating adolescence: Addressing mental health challenges through social work practice and policy. *JSWWP*, *2*(1). https://gexinonline.com/uploads/articles/article-jswwp-108.pdf

Huang, Y. (2024). Investigation of the impact of positive and negative parenting on pre-school and school-aged children's emotion regulation. *Journal of Education Humanities and Social Sciences*, *26*, 812-818. https://doi.org/10.54097/80sd5a44

Jala, S. (2023). Cognitive bias during clinical decision-making and its influence on patient outcomes in the emergency department: A scoping review. *Journal of clinical nursing*, *32*(19-20), 7076-7085. https://doi.org/10.1111/jocn.16845

Jayte, M., Mohamed, A. A., Karshe, A. H., Ali, H., & Ahmed, A. H. H. (2025). Prescription Drug Misuse and Risk Factors Among Somali Adolescents: A Qualitative Study Exploring Peer Influence, Stress, and Academic Pressure. *BMC psychiatry*, *25*(1). https://doi.org/10.1186/s12888-025-07336-8

Lanjekar, P. D., Joshi, S. H., Lanjekar, P. D., Wagh, V., & Wagh, V. (2022). The effect of parenting and the parent-child relationship on a child's cognitive development: A literature review. *Cureus*, *14*(10). https://doi.org/10.7759/cureus.30574

Marceau, K. (2023). The role of parenting in developmental trajectories of risk for adolescent substance use: A bioecological systems cascade model. *Frontiers in psychology*, *14*. https://doi.org/10.3389/fpsyg.2023.1277419

Mortazavizadeh, Z., Göllner, L., & Forstmeier, S. (2022). Emotional competence, attachment, and parenting styles in children and parents. *Psicologia Reflexão E Crítica*, *35*(1). https://doi.org/10.1186/s41155-022-00208-0

Muradian, A. A., Timerbulatova, M. F., & Timerbulatov, I. F. (2025). Non-Suicidal Self-Harm and Its Addictive Potential in Adolescents With Drug-Related Disorders. *Vestnik Nevrologii Psihiatrii I Nejrohirurgii (Bulletin of Neurology Psychiatry and Neurosurgery)*(4), 441-448. https://doi.org/10.33920/med-01-2504-02

Nikstat, A., & Riemann, R. (2022). Differences in parenting behavior are systematic sources of the non-shared environment for internalizing and externalizing problem behavior. *Behavior genetics*, *53*(1), 25-39. https://doi.org/10.1007/s10519-022-10125-8

Rafiee, F. (2023). The Role of Religious Identity in Predicting Internet Addiction and the Tendency towards Drug Use (Case Study: Adolescent Female Students in Pardis, Tehran). *Quarterly Journal of New Ideas in Psychology*, *16*(20). https://jnip.ir/browse.php?a_id=892&sid=1&slc_lang=en

Ramezani, E. (2024). Suicidal tendency and impulsivity and integrative self-knowledge among the adult population. *International Journal of High Risk Behaviors and Addiction*, *13*(1). https://doi.org/10.5812/ijhrba-137037

Sareen, R. (2022). Cognitive bias in medical decision making. *Journal of Pathology Research Reviews and Reports*, 1-6. https://doi.org/10.47363/JPR/2022(4)142

Silvers, J. A. (2022). Adolescence as a pivotal period for emotion regulation development. *Current opinion in psychology*, *44*, 258-263. https://doi.org/10.1016/j.copsyc.2021.09.023

Wang, X., He, Y., & Feng, Z. (2022). The antidepressant effect of cognitive reappraisal training on individuals cognitively vulnerable to depression: Could cognitive bias be modified through the prefrontal-amygdala circuits? *Frontiers in human neuroscience*, *16*. https://doi.org/10.3389/fnhum.2022.919002

Zhou, L., Cai, E., Chankoson, T., Sukpasjaroen, K., Wu, Y., & Liu, G. (2022). Explaining the relation between perceived social support and psychological well-being among Chinese nursing students: A serial multiple mediator model involving integrative self-knowledge and self-integrity. *Psychological Reports*, *127*(2), 594-619. https://doi.org/10.117