KMAN PUBLISHING INSTITUTE
Journal Website

Article history:
Received 16 July 2025
Revised 26 October 2025
Accepted 03 November 2025
Published online 01 April 2026

Journal of Psychosociological Research in Family and Culture

Volume 4, Issue 2, pp 1-10

E-ISSN: 3041-8550

Modeling Substance Use Risk via Family Monitoring, Sensation Seeking, and Peer Deviance

Luis. Montenegro[1], Nathaniel. Brooks[2*], Kareem. Mohammed[3]

[1] Department of Psychology, University of Panama, Panama City, Panama
[2] Department of Cognitive Psychology, McGill University, Montreal, Canada
[3] Department of Behavioral Sciences, University of the West Indies, St. Augustine, Trinidad and Tobago

*** Corresponding author email address**: nathaniel.brooks@mcgill.ca

A r t i c l e I n f o

Article type:
Original Research

How to cite this article:
Montenegro, L., Brooks, N., & Mohammed, K. (2026). Modeling Substance Use Risk via Family Monitoring, Sensation Seeking, and Peer Deviance. *Journal of Psychosociological Research in Family and Culture, 4*(2), 1-10.
https://doi.org/10.61838/kman.jprfc.5411

A B S T R A C T

Objective: The present study aimed to model substance use risk among adolescents by examining the predictive roles of family monitoring, sensation seeking, and peer deviance within an integrated analytical framework.

Methods and Materials: This study employed a quantitative, cross-sectional, correlational design among 472 high school students from urban regions of Ontario, Canada, selected through multistage cluster sampling. Data were collected using standardized self-report instruments, including the Substance Use Risk Profile Scale, the Parental Monitoring Scale, the Brief Sensation Seeking Scale, and a modified Peer Deviance Scale. All instruments demonstrated acceptable validity and reliability in previous research and within the current sample. Data analysis was conducted using IBM SPSS version 27 and AMOS version 24. Descriptive statistics and Pearson correlation coefficients were calculated, followed by multiple regression analysis to examine predictive relationships. Structural equation modeling was used to test the hypothesized model and evaluate direct and indirect effects. Model fit was assessed using standard indices including χ^2/df, CFI, TLI, GFI, and RMSEA.

Findings: The results indicated significant relationships among all study variables. Family monitoring was negatively associated with substance use risk ($\beta = -0.31$, $p < 0.001$), while sensation seeking ($\beta = 0.36$, $p < 0.001$) and peer deviance ($\beta = 0.43$, $p < 0.001$) showed positive and significant predictive effects, with peer deviance emerging as the strongest predictor. The overall regression model was significant ($F(3, 468) = 132.74$, $p < 0.001$), explaining 46% of the variance in substance use risk. Structural equation modeling demonstrated good model fit ($\chi^2/df = 2.41$, CFI = 0.95, TLI = 0.94, GFI = 0.93, RMSEA = 0.055). Indirect effects revealed that family monitoring reduced substance use risk through peer deviance, and sensation seeking partially mediated the relationship between peer deviance and substance use risk.

Conclusion: The findings highlight the multidimensional nature of adolescent substance use risk, emphasizing the combined influence of familial, personality, and peer-related factors. Family monitoring serves as a protective factor, whereas

sensation seeking and peer deviance function as significant risk enhancers. Integrative models that consider both individual dispositions and social contexts provide a more comprehensive understanding of substance use risk. These results underscore the importance of developing prevention and intervention strategies that simultaneously target family dynamics, personality traits, and peer environments to effectively reduce substance use risk among adolescents.

Keywords: *Substance Use Risk, Family Monitoring, Sensation Seeking, Peer Deviance, Adolescents, Structural Equation Modeling*

1 Introduction

Substance use among adolescents remains a critical public health concern, with far-reaching implications for physical health, psychological well-being, and long-term developmental trajectories. The initiation and escalation of substance use during adolescence are shaped by a complex interplay of individual, familial, and social factors that operate across multiple levels of influence. Contemporary research increasingly conceptualizes substance use risk not as an isolated behavioral outcome but as part of a broader constellation of risk-taking and externalizing behaviors that emerge during this developmental period (Icenogle & Cauffman, 2021; Zhang et al., 2023). Adolescence is marked by heightened neurobiological sensitivity to rewards and increased susceptibility to peer influence, which collectively contribute to experimentation with substances such as alcohol, tobacco, and illicit drugs (Icenogle & Cauffman, 2021; Murray et al., 2021). These developmental characteristics underscore the importance of identifying key predictors of substance use risk in order to inform targeted prevention and intervention strategies.

One of the most robust predictors of adolescent substance use is family monitoring, a multidimensional construct encompassing parental awareness, supervision, and communication regarding adolescents' activities and peer associations. High levels of parental monitoring have consistently been associated with reduced engagement in risky behaviors, including substance use, delinquency, and deviant peer affiliation (Davis et al., 2023; LaFreniere et al., 2021). The protective function of family monitoring operates through multiple mechanisms, including limiting opportunities for unsupervised socializing and fostering internalized norms that discourage deviance. Conversely, inadequate monitoring is linked to increased exposure to high-risk environments and peers, thereby elevating the likelihood of substance use initiation (Watts et al., 2022; Wei & Stere, 2021). However, recent scholarship has also highlighted methodological concerns in measuring parental monitoring, particularly the reliance on adolescent self-reports, which may introduce bias and complicate causal interpretations (Davis et al., 2023). Despite these limitations, the consensus remains that family monitoring constitutes a central protective factor within ecological models of adolescent risk behavior.

In parallel, sensation seeking has been identified as a key dispositional trait that predisposes adolescents to engage in substance use. Defined as the tendency to seek novel, complex, and intense experiences, sensation seeking is strongly associated with various forms of risk-taking, including substance experimentation and escalation (Michielsen et al., 2024; Qamar & Qurat-ul-ain, 2023). Neurodevelopmental models suggest that heightened sensation seeking during adolescence reflects an imbalance between socioemotional and cognitive control systems, resulting in increased responsiveness to rewarding stimuli (Murray et al., 2021). Empirical evidence consistently demonstrates that adolescents with higher sensation-seeking tendencies are more likely to initiate substance use at earlier ages and to engage in more frequent and diverse substance-related behaviors (Mahbub & Rahman, 2023; Riley et al., 2021). Furthermore, sensation seeking has been shown to interact with environmental factors, such as peer influence and family dynamics, amplifying its impact on substance use risk (Michielsen et al., 2024). These findings highlight the importance of incorporating personality-based risk factors into predictive models of substance use.

Peer deviance represents another critical determinant of adolescent substance use, reflecting the influence of social networks on behavior. Adolescents are particularly susceptible to peer norms and behaviors, and affiliation with deviant peers significantly increases the likelihood of substance use and other forms of delinquency (Sasson et al., 2022; Wilhoit & Goodnight, 2022). Theoretical frameworks such as social learning theory and differential association theory posit that behaviors are acquired through observation and reinforcement within peer contexts, making deviant peer groups a powerful conduit for the transmission of substance use behaviors (Datchi, 2022; Sârbu et al., 2022). Empirical studies have demonstrated that peer deviance not only predicts substance use directly but also mediates the relationship between individual traits, such as impulsivity

JPRFC
E-ISSN: 3041-8550

and sensation seeking, and substance-related outcomes (Wilhoit & Goodnight, 2022). Moreover, the increasing prevalence of unstructured socializing among adolescents has been linked to greater opportunities for deviant behavior, including substance use (Osgood, 2023). These findings underscore the central role of peer environments in shaping adolescent risk behavior.

The interaction between family monitoring, sensation seeking, and peer deviance is particularly salient in understanding substance use risk. Ecological and developmental models emphasize that these factors do not operate in isolation but rather interact dynamically to influence behavior. For instance, low levels of parental monitoring may facilitate greater exposure to deviant peers, which in turn amplifies the influence of sensation-seeking tendencies on substance use (LaFreniere et al., 2021; Wilhoit & Goodnight, 2022). Similarly, adolescents with high sensation seeking may actively seek out deviant peer groups, thereby reinforcing risk behaviors through social processes (Kübel et al., 2024). Longitudinal research supports these pathways, demonstrating that peer deviance mediates the relationship between family factors and substance use outcomes over time (LaFreniere et al., 2021). These interconnections highlight the need for integrative models that capture the complexity of adolescent risk behavior.

Recent advances in computational methods have further enhanced the capacity to model substance use risk by incorporating multiple predictors simultaneously. Machine learning approaches, in particular, have shown promise in identifying complex, non-linear relationships among risk factors and improving the accuracy of predictive models (Grummitt et al., 2025; Negriff et al., 2022). These methods allow for the integration of diverse data sources and the detection of interaction effects that may be overlooked in traditional statistical analyses. For example, machine learning models have been used to predict risky alcohol use and marijuana use among adolescents by combining individual, familial, and social variables (Grummitt et al., 2025; Negriff et al., 2022). Such approaches align with the growing emphasis on precision prevention, which seeks to tailor interventions based on individual risk profiles.

In addition to methodological advancements, recent research has highlighted the broader contextual factors that shape adolescent substance use. Socioeconomic conditions, cultural norms, and environmental stressors all contribute to variations in substance use risk across populations (Kabiri et al., 2022; Osadolor & Onyejaka, 2022). For instance, exposure to harsh and unpredictable environments has been linked to the development of short-term mindsets and increased engagement in delinquent behaviors, including substance use (Deitzer, Frankenhuis, Ribeaud, et al., 2024). Similarly, changes in social structures and cultural expectations have influenced patterns of adolescent behavior, including the rise and decline of certain risk behaviors over time (Lu, 2024; Osgood, 2023). These findings suggest that substance use risk must be understood within a broader socioecological framework that accounts for both proximal and distal influences.

Gender differences and developmental trajectories also play a significant role in shaping substance use risk. Research indicates that males and females may differ in their susceptibility to certain risk factors, such as sensation seeking and peer influence, although these differences are often moderated by contextual variables (Lu, 2024; Oliveira, 2025). Additionally, the timing of developmental transitions, such as puberty, has been associated with variations in risk-taking behavior and susceptibility to external influences (Michielsen et al., 2024). These developmental considerations underscore the importance of adopting a life-course perspective in the study of substance use.

Furthermore, emerging evidence suggests that digital environments and media exposure may influence adolescent risk behavior, including substance use. The proliferation of digital media has created new contexts for social interaction and exposure to risk-related content, which may interact with traditional risk factors such as peer deviance and sensation seeking (Jensen et al., 2022). While the mechanisms underlying these influences are still being explored, they represent an important area for future research.

Finally, it is important to recognize that substance use risk is not solely determined by risk factors but is also influenced by protective factors that can mitigate adverse outcomes. Positive family relationships, supportive peer networks, and adaptive coping strategies have all been shown to reduce the likelihood of substance use among adolescents (Watts et al., 2022; Wei & Stere, 2021). Identifying and تعزيز these protective factors is essential for the development of effective prevention programs.

Despite the substantial body of research on adolescent substance use, several gaps remain. In particular, there is a need for integrative models that simultaneously examine the interplay between family monitoring, sensation seeking, and peer deviance using advanced analytical techniques. Additionally, more research is needed to explore how these factors interact across different cultural and socioeconomic

JPRFC
E-ISSN: 3041-8550

contexts, as well as how they evolve over time. Addressing these gaps will enhance our understanding of the mechanisms underlying substance use risk and inform the development of targeted interventions.

Therefore, the aim of the present study is to model substance use risk among adolescents by examining the predictive roles of family monitoring, sensation seeking, and peer deviance within an integrated analytical framework.

2 Methods and Materials

2.1 Study Design and Participants

The present study employed a quantitative, cross-sectional, correlational design to examine the predictive role of family monitoring, sensation seeking, and peer deviance in substance use risk among adolescents. The target population consisted of high school students enrolled in public secondary schools across urban regions of Ontario, Canada. Using a multistage cluster sampling procedure, schools were first randomly selected from different districts, followed by the random selection of classrooms within each school. A total of 472 students participated in the study, with ages ranging from 15 to 18 years. Inclusion criteria required participants to be currently enrolled students with sufficient proficiency in English to comprehend the questionnaire items.

2.2 Measures

Data collection was conducted using standardized self-report instruments with established psychometric properties. Substance use risk was assessed using the Substance Use Risk Profile Scale (SURPS), originally developed by Woicik et al. in 2009, which consists of 23 items measuring personality-related risk factors for substance misuse across four subscales: anxiety sensitivity, hopelessness, impulsivity, and sensation seeking. Items are rated on a Likert scale, and higher scores indicate greater vulnerability to substance use behaviors. Family monitoring was measured using the Parental Monitoring Scale developed by Stattin and Kerr in 2000, comprising items that assess parental knowledge, control, and adolescent disclosure regarding daily activities. This instrument includes multiple subscales and uses a Likert-type response format, with higher scores reflecting greater perceived parental monitoring. Sensation seeking was further evaluated using the Brief Sensation Seeking Scale (BSSS), developed by Hoyle et al. in 2002, which includes 8 items capturing thrill and adventure seeking, experience seeking, disinhibition, and boredom susceptibility. Peer deviance was assessed using a modified version of the Peer Delinquency Scale, which measures the extent to which participants associate with peers engaged in rule-breaking or antisocial behaviors. All instruments have demonstrated satisfactory validity and reliability in previous adolescent samples, and internal consistency coefficients in the present study were confirmed to be within acceptable ranges.

2.3 Data Analysis

Data analysis was conducted using IBM SPSS Statistics version 27 and AMOS version 24 for structural equation modeling. Initially, descriptive statistics were calculated to summarize the central tendencies and dispersion of the study variables. Pearson correlation coefficients were then computed to examine the bivariate relationships among family monitoring, sensation seeking, peer deviance, and substance use risk. To test the hypothesized predictive model, multiple regression analysis was performed to determine the extent to which the independent variables explained variance in substance use risk. Subsequently, a structural equation modeling approach was employed to assess the overall fit of the proposed model and to estimate direct and indirect effects among variables. Model fit was evaluated using several indices, including the chi-square statistic, the ratio of chi-square to degrees of freedom, the Comparative Fit Index, the Tucker–Lewis Index, the Goodness-of-Fit Index, and the Root Mean Square Error of Approximation. Statistical significance was set at $p < 0.05$ for all analyses, and assumptions of normality, linearity, and multicollinearity were examined prior to conducting inferential tests.

3 Findings and Results

The demographic profile of the sample indicated that out of the 472 participants, 238 (50.42%) were female and 234 (49.58%) were male. The mean age of participants was 16.71 years (SD = 1.02), with the majority of students distributed across grades 10 to 12. In terms of socioeconomic background, approximately 46.18% of participants reported a middle-income family status, 31.57% reported a lower-income status, and 22.25% reported a higher-income background. Ethnic composition reflected the multicultural nature of Canadian urban populations, with participants identifying as Caucasian (38.14%), Asian (27.76%), African or Caribbean descent (18.22%), and other backgrounds

JPRFC
E-ISSN: 3041-8550

(15.88%). Regarding substance use exposure, 41.32% of participants reported having experimented with at least one substance (e.g., alcohol, tobacco, or cannabis), while 58.68% reported no prior use, indicating variability in substance-related behaviors suitable for predictive modeling.

Table 1 presents the descriptive statistics, including means and standard deviations, for the main study variables: family monitoring, sensation seeking, peer deviance, and substance use risk.

Table 1

Descriptive Statistics for Study Variables

Variable	Mean	Standard Deviation
Family Monitoring	3.47	0.62
Sensation Seeking	3.21	0.58
Peer Deviance	2.76	0.67
Substance Use Risk	3.05	0.64

The descriptive statistics indicate that family monitoring had the highest mean score among the variables, suggesting relatively moderate to high perceived parental oversight within the sample. Sensation seeking and substance use risk demonstrated moderate levels, while peer deviance showed comparatively lower mean values, although with a slightly higher dispersion. The variability across all constructs, as reflected in the standard deviations, supports the suitability of the data for further correlational and predictive analyses.

Table 2 presents the Pearson correlation coefficients among the study variables, along with their statistical significance levels.

Table 2

Correlation Matrix Among Study Variables

Variable	1	2	3	4
1. Family Monitoring	1.00	-0.34**	-0.41**	-0.38**
2. Sensation Seeking	-0.34**	1.00	0.46**	0.52**
3. Peer Deviance	-0.41**	0.46**	1.00	0.57**
4. Substance Use Risk	-0.38**	0.52**	0.57**	1.00

The correlation analysis revealed several statistically significant relationships among the variables. Family monitoring was negatively correlated with sensation seeking ($r = -0.34$, $p < 0.01$), peer deviance ($r = -0.41$, $p < 0.01$), and substance use risk ($r = -0.38$, $p < 0.01$), indicating that higher levels of parental monitoring are associated with lower engagement in risk-related behaviors and tendencies. In contrast, sensation seeking showed strong positive correlations with both peer deviance ($r = 0.46$, $p < 0.01$) and substance use risk ($r = 0.52$, $p < 0.01$), suggesting that individuals with higher sensation-seeking tendencies are more likely to associate with deviant peers and exhibit elevated substance use risk. Peer deviance demonstrated the strongest positive association with substance use risk ($r = 0.57$, $p < 0.01$), highlighting its central role as a social influence factor in substance-related behaviors.

Table 3

Multiple Regression Analysis Predicting Substance Use Risk

Predictor	B	SE	Beta	t	p
Family Monitoring	-0.29	0.05	-0.31	-5.84	<0.001
Sensation Seeking	0.34	0.06	0.36	6.12	<0.001
Peer Deviance	0.41	0.05	0.43	7.28	<0.001

Model Summary: $R = 0.68$, $R^2 = 0.46$, Adjusted $R^2 = 0.45$, $F(3, 468) = 132.74$, $p < 0.001$

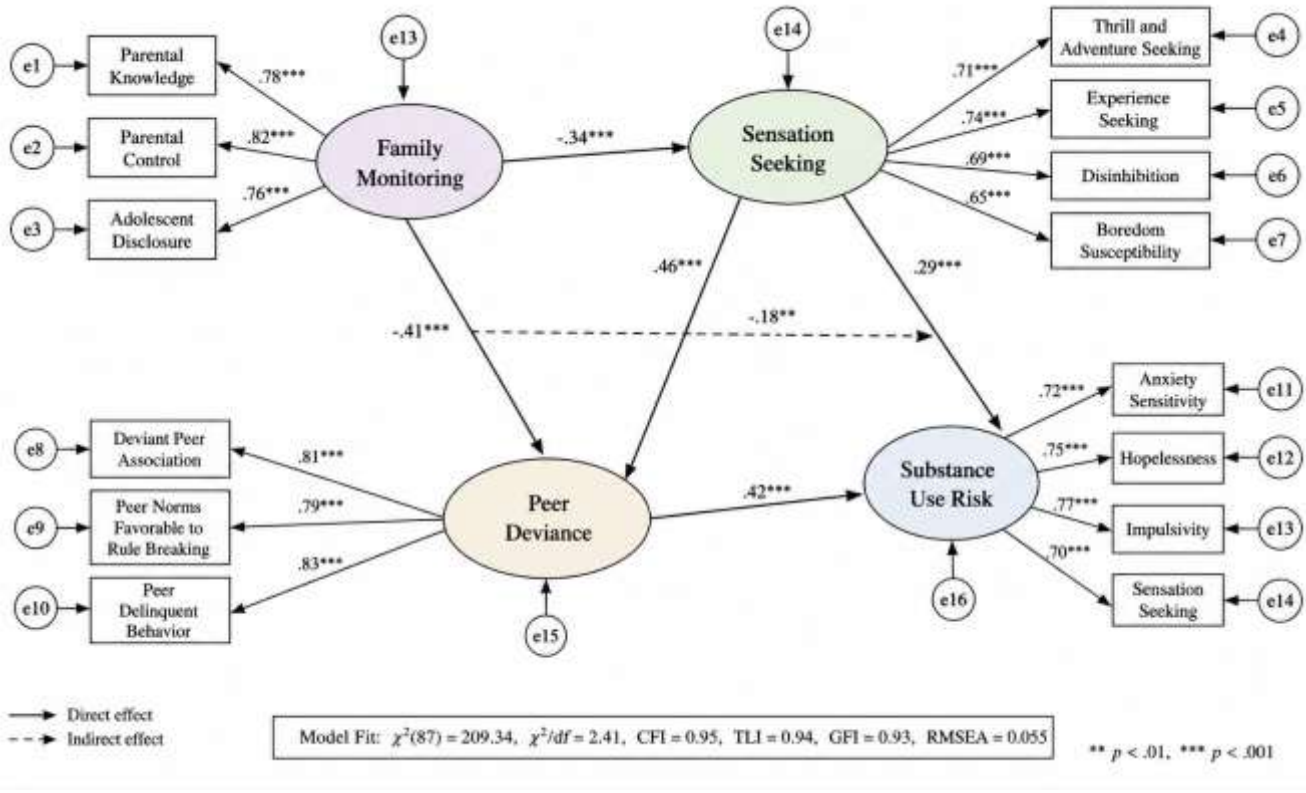
The regression model was statistically significant, explaining approximately 46% of the variance in substance use risk. Among the predictors, peer deviance emerged as the strongest predictor ($\beta = 0.43$, $p < 0.001$), followed by

JPRFC E-ISSN: 3041-8550

sensation seeking (β = 0.36, p < 0.001), both positively associated with substance use risk. Family monitoring showed a significant negative predictive effect (β = -0.31, p < 0.001), indicating its protective role against substance-related risk behaviors. The overall model fit indices suggest a robust predictive structure, with substantial explanatory power.

Figure 1

Structural Equation Model of Substance Use Risk Based on Family Monitoring, Sensation Seeking, and Peer Deviance



The structural equation modeling analysis further supported the hypothesized relationships among variables. The model demonstrated an acceptable fit to the data, with fit indices indicating good model adequacy ($\chi^2/df = 2.41$, CFI = 0.95, TLI = 0.94, GFI = 0.93, RMSEA = 0.055). Direct paths from sensation seeking and peer deviance to substance use risk were positive and statistically significant, while the path from family monitoring to substance use risk was negative and significant. Additionally, indirect effects were observed, whereby family monitoring negatively influenced substance use risk through its impact on peer deviance, and sensation seeking partially mediated the relationship between peer deviance and substance use risk. These findings collectively confirm the multidimensional and interrelated nature of psychological and social determinants underlying substance use risk among adolescents.

4 Discussion

The present study sought to model substance use risk among adolescents by examining the predictive roles of family monitoring, sensation seeking, and peer deviance within an integrated analytical framework. The findings provide strong empirical support for the hypothesized relationships, demonstrating that these variables are significantly interrelated and collectively explain a substantial proportion of variance in substance use risk. Specifically, the results indicated that family monitoring exerted a significant negative effect on substance use risk, while sensation seeking and peer deviance showed significant positive effects, with peer deviance emerging as the strongest predictor. These findings are consistent with ecological and developmental models of adolescent behavior, which emphasize the interplay of individual traits

JPRFC
E-ISSN: 3041-8550

and social contexts in shaping risk outcomes (Datchi, 2022; Murray et al., 2021).

The protective role of family monitoring observed in this study aligns with a robust body of literature demonstrating that parental supervision and awareness serve as critical buffers against adolescent engagement in risky behaviors. Higher levels of family monitoring were associated with lower levels of substance use risk, suggesting that parental involvement may limit adolescents' exposure to high-risk situations and reinforce prosocial norms. This finding is consistent with prior research indicating that effective parental monitoring reduces opportunities for unstructured socializing and deviant peer association, thereby decreasing the likelihood of substance use (LaFreniere et al., 2021; Wei & Stere, 2021). Moreover, the negative association between family monitoring and peer deviance observed in the structural model supports the notion that family processes indirectly influence adolescent behavior through peer selection mechanisms. This is in line with studies showing that adolescents with higher parental monitoring are less likely to affiliate with deviant peers, which in turn reduces substance use risk (Sasson et al., 2022; Wilhoit & Goodnight, 2022). At the same time, the present findings extend previous research by demonstrating that the protective effects of family monitoring remain significant even when accounting for individual personality traits such as sensation seeking, highlighting its independent contribution to risk reduction.

Sensation seeking emerged as a significant positive predictor of substance use risk, corroborating extensive evidence linking this personality trait to risk-taking behaviors during adolescence. Adolescents with higher levels of sensation seeking were more likely to report elevated substance use risk, reflecting their tendency to pursue novel and stimulating experiences despite potential negative consequences. This finding is consistent with neurodevelopmental models that attribute heightened sensation seeking in adolescence to increased sensitivity of reward-related brain systems (Icenogle & Cauffman, 2021; Murray et al., 2021). Empirical studies have similarly documented strong associations between sensation seeking and substance use initiation, frequency, and escalation (Qamar & Qurat-ul-ain, 2023; Riley et al., 2021). Furthermore, the present results indicate that sensation seeking is positively associated with peer deviance, suggesting that adolescents with high sensation-seeking tendencies may actively seek out peer groups that engage in risky behaviors. This finding aligns with research demonstrating that sensation seeking influences both the selection of peer environments and the susceptibility to peer influence (Kübel et al., 2024; Michielsen et al., 2024). Thus, sensation seeking appears to function both as a direct predictor of substance use risk and as an indirect factor operating through social pathways.

Peer deviance was identified as the strongest predictor of substance use risk in the current study, underscoring the central role of peer influences in adolescent behavior. The strong positive association between peer deviance and substance use risk is consistent with theoretical perspectives such as social learning theory and differential association theory, which posit that behaviors are acquired and reinforced within social contexts (Datchi, 2022; Sârbu et al., 2022). Adolescents who associate with peers engaged in deviant behaviors are more likely to adopt similar behaviors due to processes of modeling, reinforcement, and normative influence. This finding is supported by prior research demonstrating that deviant peer affiliation is a key mediator linking individual traits, such as impulsivity and sensation seeking, to substance use outcomes (Wilhoit & Goodnight, 2022). Additionally, the results align with studies showing that unstructured socializing with peers increases opportunities for engagement in risky behaviors, including substance use (Osgood, 2023). The prominence of peer deviance as a predictor highlights the importance of targeting peer networks in prevention efforts.

The structural equation modeling results further elucidate the complex interplay among the study variables, revealing both direct and indirect pathways to substance use risk. Notably, family monitoring was found to exert an indirect effect on substance use risk through its influence on peer deviance, supporting the hypothesis that parental practices shape adolescent behavior by influencing peer selection. This finding is consistent with longitudinal research demonstrating that parental monitoring reduces the likelihood of affiliating with deviant peers, thereby decreasing subsequent substance use (LaFreniere et al., 2021). Similarly, sensation seeking was found to partially mediate the relationship between peer deviance and substance use risk, indicating that individual predispositions interact with social contexts to amplify risk. These results are in line with integrative models of adolescent development, which emphasize the dynamic interaction between individual and environmental factors (Murray et al., 2021).

The findings of this study also resonate with recent advances in machine learning approaches to risk prediction,

JPRFC
E-ISSN: 3041-8550

which emphasize the importance of incorporating multiple interacting variables to improve predictive accuracy. Studies using machine learning techniques have demonstrated that combining individual, familial, and social factors yields more robust models of substance use risk compared to traditional approaches (Grummitt et al., 2025; Negriff et al., 2022). Although the present study employed structural equation modeling rather than machine learning, the results highlight the value of integrative analytical frameworks in capturing the complexity of adolescent behavior. The substantial proportion of variance explained by the model suggests that the selected variables constitute a meaningful set of predictors, although additional factors may further enhance predictive accuracy.

In addition to the primary findings, the results should be interpreted within the broader socioecological context of adolescent development. Factors such as socioeconomic status, cultural norms, and environmental stressors may influence the relationships observed in this study. For example, exposure to harsh or unpredictable environments has been linked to the development of short-term mindsets and increased engagement in delinquent behaviors, including substance use (Deitzer, Frankenhuis, Jacobsen, et al., 2024; Deitzer, Frankenhuis, Ribeaud, et al., 2024). Similarly, cross-cultural variations in health-risk behaviors highlight the importance of contextualizing findings within specific populations (Liu et al., 2025). The multicultural composition of the present sample provides some support for the generalizability of the findings, although further research is needed to examine these relationships in diverse settings.

Moreover, the findings are consistent with research on developmental trajectories of risk behavior, which suggests that substance use is part of a broader pattern of externalizing behaviors that evolve over time (Brislin et al., 2024; Lu, 2024). The observed associations between sensation seeking, peer deviance, and substance use risk reflect underlying processes related to self-control, decision-making, and socialization. For instance, low self-control has been identified as a key factor linking individual traits to delinquent behavior and substance use (Boccio, 2023; Oliveira, 2025). Similarly, transitions from normative to deviant behavior have been associated with changes in social environments and normative expectations during adolescence (Kabiri et al., 2022; Sârbu et al., 2022). These findings underscore the importance of adopting a developmental perspective in understanding substance use risk.

5 Conclusion

Finally, the results align with research on the initiation and continuation of substance use, which highlights the role of both individual motivations and social influences. Adolescents may initiate substance use due to curiosity, peer pressure, or the desire for novel experiences, and continued use may be reinforced by social and psychological factors (Mahbub & Rahman, 2023; Molina et al., 2021). The present findings suggest that interventions targeting both individual traits and social contexts may be most effective in reducing substance use risk.

The present study is subject to several limitations that should be considered when interpreting the findings. First, the cross-sectional design precludes causal inferences, as the observed relationships may be influenced by bidirectional or unmeasured factors. Second, the reliance on self-report measures introduces the possibility of response bias, including social desirability and recall bias, which may affect the accuracy of the data. Third, although the sample was diverse, it was limited to adolescents in a specific geographic region, which may constrain the generalizability of the findings to other populations. Fourth, the study focused on a limited of variables and did not include other potentially important predictors, such as mental health factors, genetic influences, or broader environmental variables.

Future research should address these limitations by employing longitudinal designs to examine the temporal dynamics of substance use risk and to establish causal relationships among variables. In addition, incorporating multiple sources of data, such as parent reports, teacher assessments, and objective behavioral measures, would enhance the validity of findings. Further studies should also explore the role of additional variables, including mental health indicators, digital media exposure, and cultural factors, in shaping substance use risk. The application of advanced analytical techniques, such as machine learning and network analysis, may provide deeper insights into the complex interactions among risk factors. Moreover, cross-cultural research is needed to examine the generalizability of the findings and to identify context-specific determinants of substance use.

From a practical perspective, the findings of this study have important implications for prevention and intervention efforts. Programs aimed at reducing adolescent substance use should prioritize strengthening family monitoring practices, enhancing parental communication, and

JPRFC
E-ISSN: 3041-8550

promoting supportive family environments. Interventions targeting sensation seeking may focus on providing alternative outlets for novelty and excitement, such as structured extracurricular activities, to reduce the appeal of substance use. Additionally, strategies to reduce peer deviance, such as promoting prosocial peer networks and implementing school-based interventions, may be particularly effective. Overall, a comprehensive approach that addresses both individual and social factors is likely to yield the greatest impact in reducing substance use risk among adolescents.

Authors' Contributions

All authors have contributed significantly to the research process and the development of the manuscript.

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 would like to express our gratitude to all individuals helped us to do the project.

Declaration of Interest

The authors report no conflict of interest.

Funding

This research was carried out independently with personal funding and without the financial support of any governmental or private institution or organization.

Ethical Considerations

The study protocol adhered to the principles outlined in the Helsinki Declaration, which provides guidelines for ethical research involving human participants.

References

Boccio, C. M. (2023). Low Self-Control, Peer Risk Factors, and Adolescent Vaping Activity. *Crime & Delinquency*, *70*(9), 2514-2531. https://doi.org/10.1177/00111287231160739

Brislin, S. J., Choi, M., & Hicks, B. M. (2024). Characterizing Delinquent Behavior in Early Adolescence: Results From the Adolescent Brain Cognitive Development- Social Development Study. https://doi.org/10.31234/osf.io/5k9aw

Datchi, C. C. (2022). The Ecology of Delinquency and Crime. 43-65. https://doi.org/10.1037/0000285-004

Davis, I., Aks, I. R., Patel, H., Leitz, L., & Pelham, W. E. (2023). How Much Should We Trust Non-Experimental Studies of Parental Monitoring? https://doi.org/10.31234/osf.io/v8947

Deitzer, J. R., Frankenhuis, W. E., Jacobsen, W. C., Ribeaud, D., Eisner, M., Feinberg, M. E., & Gelder, J. L. v. (2024). Why Do Harsh and Unpredictable Environments Lead to Delinquency? The Case for Unpredictability Schemas and Short-Term Mindsets. *Journal of Research in Crime and Delinquency*, *62*(1), 136-193. https://doi.org/10.1177/00224278241275573

Deitzer, J. R., Frankenhuis, W. E., Ribeaud, D., Eisner, M., & Gelder, J. L. v. (2024). Effect of Early Interactions With the Police on Intertemporal Choice: A Longitudinal Study of Zurich Public School Students. *Crime & Delinquency*, *71*(9), 3094-3127. https://doi.org/10.1177/00111287241264224

Grummitt, L., Visontay, R., Clare, P., Slade, T., & Birrell, L. (2025). Multivariable Machine Learning Prediction of Risky Alcohol Use in Contemporary Youth. *Addiction*. https://doi.org/10.1111/add.70145

Icenogle, G., & Cauffman, E. (2021). Adolescent Decision Making: A Decade in Review. *Journal of Research on Adolescence*, *31*(4), 1006-1022. https://doi.org/10.1111/jora.12608

Jensen, M., Weinstein, M., Brown, M. T., & Navarro, J. (2022). Digital Media in Adolescent Health Risk and Externalizing Behaviors. 264-299. https://doi.org/10.1017/9781108976237.015

Kabiri, S., Sharepour, M., Howell, C. J., Wellen, H., Smith, H. P., Cochran, J. K., Shadmanfaat, S. M., & Andersen, T. S. (2022). Violations of Emergent Norms Regarding COVID-19 Mitigation and Social Hygiene: An Application of Agnew's General Theory of Crime. *Crime & Delinquency*, *71*(2), 575-610. https://doi.org/10.1177/00111287221130961

Kübel, S. L., Deitzer, J. R., Frankenhuis, W. E., Ribeaud, D., Eisner, M., & Gelder, J. L. v. (2024). Beyond the Situation: Hanging Out With Peers Now Is Associated With Short-Term Mindsets Later. *Journal of Developmental and Life-Course Criminology*, *10*(1), 51-72. https://doi.org/10.1007/s40865-024-00249-2

LaFreniere, L. S., Newman, M. G., & Graham, J. W. (2021). Parental Support and Monitoring Influences on Adolescent Alcohol Use: A Peer Selection Mediation Model. *Mental Health and Addiction Research*, *6*(2). https://doi.org/10.15761/mhar.1000202

Liu, M., Tang, X., Xia, Q., Wu, X., Yang, Y., Hong, X., & Hu, J. (2025). Patterns of Health-Risk Behaviors Among Chinese Adolescents During the COVID-19 Pandemic: A Latent Class Analysis. *BMC public health*, *25*(1). https://doi.org/10.1186/s12889-025-22089-5

Lu, Y. (2024). Examining the Decline in Gender-Specific Youth Offending Since the 1990s: A Decomposition Analysis of Two Cohorts. *Crime & Delinquency*, *71*(13-14), 3940-3966. https://doi.org/10.1177/00111287241290512

Mahbub, F., & Rahman, Z. U. (2023). The Rationale for Initiation and Continuation of Drug Abuse Among Female Users: A Study of the Youth in Dhaka City. *Social Science Review*, *40*(1), 21-39. https://doi.org/10.3329/ssr.v40i1.69071

Michielsen, P. J. S., Spaan, P., Ravensbergen, S. J., Nita, G. M. d. N.-E., Hoogendijk, W. J., Mil, N. H. G., & Roza, S. J. (2024). Puberty Timing and Adolescent Antisocial Behavior: The Role of Callous-Unemotional Traits, Sensation Seeking, and

JPRFC
E-ISSN: 3041-8550

Parental Hostility. *International journal of offender therapy and comparative criminology*, *69*(16), 2338-2358. https://doi.org/10.1177/0306624x241306896

Molina, B. S. G., Joseph, H. M., Kipp, H., Lindstrom, R. A., Pedersen, S. L., Kolko, D. J., Bauer, D. J., & Subramaniam, G. (2021). Adolescents Treated for Attention-Deficit/Hyperactivity Disorder in Pediatric Primary Care: Characterizing Risk for Stimulant Diversion. *Journal of Developmental & Behavioral Pediatrics*, *42*(7), 540-552. https://doi.org/10.1097/dbp.0000000000000923

Murray, A. L., Mirman, J. H., Carter, L., & Eisner, M. (2021). Individual and Developmental Differences in Delinquency: Can They Be Explained by Adolescent Risk-Taking Models? *Developmental Review*, *62*, 100985. https://doi.org/10.1016/j.dr.2021.100985

Negriff, S., Dilkina, B., Matai, L., & Rice, E. (2022). Using Machine Learning to Determine the Shared and Unique Risk Factors for Marijuana Use Among Child-Welfare Versus Community Adolescents. *PLoS One*, *17*(9), e0274998. https://doi.org/10.1371/journal.pone.0274998

Oliveira, N. A. (2025). Gender Differences in Self-Control and Offending in Brazilian Adolescents. *Journal of Contemporary Criminal Justice*. https://doi.org/10.1177/10439862251385375

Osadolor, O. O., & Onyejaka, N. K. (2022). Substance Abuse and Oral Health of Adolescence. *Journal of Nepalese Association of Pediatric Dentistry*, *3*(1), 44-46. https://doi.org/10.3126/jnapd.v3i1.50065

Osgood, D. L. (2023). Delinquency, Unstructured Socializing, and Social Change: The Rise and Fall of a Teen Culture of Independence. *Criminology*, *61*(4), 681-704. https://doi.org/10.1111/1745-9125.12358

Qamar, F., & Qurat-ul-ain, A. (2023). Impulsivity, Sensation-Seeking, Emotional Neglect, and Delinquent Behavior Among Pakistani E-Cigarette Users. *Journal of Professional & Applied Psychology*, *4*(3), 400-417. https://doi.org/10.52053/jpap.v4i3.213

Riley, B. J., Oster, C., Rahamathulla, M., & Lawn, S. (2021). Attitudes, Risk Factors, and Behaviours of Gambling Among Adolescents and Young People: A Literature Review and Gap Analysis. *International journal of environmental research and public health*, *18*(3), 984. https://doi.org/10.3390/ijerph18030984

Sârbu, E. A., Nadolu, B., Runcan, R., Tomiţă, M., & Lazăr, F. (2022). Social Predictors of the Transition From Anomie to Deviance in Adolescence. *PLoS One*, *17*(6), e0269236. https://doi.org/10.1371/journal.pone.0269236

Sasson, H., Tur-Sinai, A., Dvir, K., & Harel-Fisch, Y. (2022). The Role of Parents and Peers in Cyberbullying Perpetration: Comparison Among Arab and Jewish and Youth in Israel. *Child Indicators Research*, *16*(2), 717-737. https://doi.org/10.1007/s12187-022-09986-6

Watts, A. L., Megahan, J. F., Conlin, W., Doss, M. I., & Sher, K. J. (2022). Sociodemographic Differences in Youth Alcohol Sipping's Nomological Network. *Alcoholism Clinical and Experimental Research*, *46*(4), 589-599. https://doi.org/10.1111/acer.14790

Wei, F., & Stere, M. J. (2021). Protective and Risk Factors of Alcohol Use Among Southeastern Pennsylvania Youth. *Social Development Issues*, *42*(3). https://doi.org/10.3998/sdi.17872073.0042.307

Wilhoit, S. A., & Goodnight, J. A. (2022). Deviant Peer Affiliation Mediates the Prospective Association From Impulsivity to Alcohol Use in Late Adolescence. *Journal of adolescence*, *95*(3), 454-467. https://doi.org/10.1002/jad.12127

Zhang, S., Marsiglia, F. F., & Zhang, Y. (2023). Adolescents' Substance Use Initiation and Transitions Across Alcohol, Tobacco, and Illicit Drugs: A Survival Analysis Approach. *Families in Society the Journal of Contemporary Social Services*, *105*(4), 539-550. https://doi.org/10.1177/10443894231190251

JPRFC
E-ISSN: 3041-8550