KMAN PUBLISHING INSTITUTE
Journal Website

Article history:
Received 10 September 2025
Revised 08 February 2026
Accepted 15 February 2026
Published online 01 May 2026

Journal of Adolescent and Youth Psychological Studies

Volume 7, Issue 5, pp 1-14

E-ISSN: 2981-2526

Bayesian Network Modeling of Youth Substance Use Risk Based on Trauma Exposure, Reward Sensitivity, Peer Pressure, Sleep Instability, and Psychological Inflexibility

Shana. Clarke[1], Allison. Freeman[2*]

[1] Department of Behavioral Psychology, University of the West Indies, Cave Hill, Barbados
[2] Department of Clinical Psychology, Stanford University, Stanford, USA

*** Corresponding author email address**: allison.freeman@stanford.edu

A r t i c l e I n f o

Article type:
Original Research

How to cite this article:
Clarke, S., & Freeman, A. (2026). Bayesian Network Modeling of Youth Substance Use Risk Based on Trauma Exposure, Reward Sensitivity, Peer Pressure, Sleep Instability, and Psychological Inflexibility. *Journal of Adolescent and Youth Psychological Studies*, *7*(5), 1-14.
http://dx.doi.org/10.61838/kman.jayps.5472

A B S T R A C T

Objective: The present study aimed to develop and evaluate a Bayesian network model for predicting youth substance use risk based on trauma exposure, reward sensitivity, peer pressure, sleep instability, and psychological inflexibility among adolescents and emerging adults in the United States.

Methods and Materials: This study employed a cross-sectional predictive modeling design using Bayesian probabilistic network analysis. The statistical population consisted of adolescents and emerging adults aged 15 to 22 years from educational institutions in the United States, from whom 1,248 participants were selected through multistage stratified sampling. Data were collected using the Substance Use Risk Profile Scale, Childhood Trauma Questionnaire-Short Form, Behavioral Activation System Scale, Peer Pressure Inventory, Sleep Condition Indicator, and Acceptance and Action Questionnaire-II. Data analysis was conducted using SPSS version 29 and Python 3.11. Bayesian network structure learning was implemented using the Hill-Climbing optimization algorithm with Bayesian Information Criterion scoring. Predictive performance was evaluated using classification accuracy, precision, recall, F1-score, sensitivity, specificity, and area under the receiver operating characteristic curve.

Findings: The findings demonstrated significant positive relationships among trauma exposure, reward sensitivity, peer pressure, sleep instability, psychological inflexibility, and substance use risk. Psychological inflexibility showed the strongest correlation with substance use risk ($r = .65$, $p < .01$), followed by trauma exposure ($r = .61$, $p < .01$). The Bayesian network model demonstrated high predictive performance with a training accuracy of 89.41%, testing accuracy of 86.93%, and area under the curve value of 0.91. Sensitivity analysis indicated that psychological inflexibility represented the strongest predictor within the network structure, followed by trauma exposure, peer pressure, reward sensitivity, and sleep instability. The probabilistic network further revealed that trauma exposure functioned as a central upstream variable influencing psychological inflexibility, peer pressure susceptibility, and sleep instability pathways associated with elevated substance use vulnerability.

Conclusion: The findings suggest that youth substance use vulnerability is shaped by a multidimensional network of emotional, cognitive, behavioral, and social risk mechanisms. Bayesian network modeling provided a powerful computational framework for identifying conditional dependency pathways

among trauma exposure, reward sensitivity, peer pressure, sleep instability, psychological inflexibility, and substance use risk. The results highlight the importance of trauma-informed and multidimensional prevention strategies targeting emotional regulation, sleep health, peer influence processes, and psychological flexibility in adolescents and emerging adults.
Keywords: *Youth Substance Use, Bayesian Network Modeling, Trauma Exposure, Reward Sensitivity, Peer Pressure, Sleep Instability, Psychological Inflexibility, Adolescents, Emerging Adults, Predictive Modeling*

1. Introduction

Substance use among adolescents and emerging adults has become one of the most significant public health concerns worldwide due to its long-term psychological, behavioral, educational, and social consequences. The developmental period of adolescence is characterized by rapid neurobiological maturation, heightened emotional sensitivity, increased peer orientation, and experimentation with novel experiences, all of which contribute to elevated vulnerability toward risky behaviors and psychoactive substance use (Nath et al., 2022). Contemporary epidemiological findings indicate that substance experimentation often begins during middle and late adolescence and progressively develops into chronic maladaptive patterns if early risk mechanisms remain unidentified (Akunna & Lucyann, 2023). Youth substance use has been associated with impaired academic functioning, emotional dysregulation, psychiatric comorbidity, family dysfunction, violence exposure, and increased mortality risk, making it a major challenge for mental health systems and prevention science (Sarkingobir & Tukur, 2024). In recent years, scholars have increasingly emphasized that adolescent substance use cannot be adequately explained through single-variable approaches because addiction vulnerability emerges from complex interactions among biological, psychological, social, and environmental determinants (Belfiore et al., 2024). Consequently, multidimensional and computational frameworks capable of modeling probabilistic interdependencies among risk factors have become increasingly necessary.

One of the most consistently identified predictors of adolescent substance use is trauma exposure and childhood adversity. Exposure to emotional neglect, physical abuse, violence, family instability, and chronic stress has been shown to alter emotional regulation systems, increase impulsive coping behaviors, and heighten vulnerability to addictive patterns during adolescence (Ramírez et al., 2025). Trauma-related developmental disruptions often contribute to maladaptive stress-response mechanisms that increase the likelihood of using psychoactive substances as emotional escape strategies or self-regulatory tools (Powell, 2021). Research has demonstrated that adolescents with histories of adverse experiences exhibit significantly higher rates of alcohol misuse, cannabis consumption, nicotine dependence, and polysubstance experimentation compared with non-traumatized peers (Igunma et al., 2022). The neurodevelopmental consequences of trauma exposure may include dysregulation within reward-processing systems, impaired executive functioning, and increased emotional reactivity, thereby intensifying susceptibility to substance-related reinforcement mechanisms (Adindu et al., 2024). Moreover, recent evidence suggests that trauma experiences may influence not only direct behavioral outcomes but also broader interpersonal and cognitive processes such as shame, social withdrawal, emotional rigidity, and self-destructive coping strategies (Rizk-Hildbrand et al., 2025). These findings underscore the importance of examining trauma exposure as a central upstream factor within broader probabilistic models of adolescent substance use risk.

In addition to trauma exposure, reward sensitivity has emerged as a major neuropsychological mechanism associated with addictive behaviors in adolescents. Reward sensitivity refers to heightened responsiveness to pleasurable stimuli, novelty-seeking tendencies, and motivational reactivity toward reinforcing experiences (Ma, 2026). Adolescence is characterized by developmental asymmetry between rapidly maturing reward systems and relatively immature cognitive control systems, which increases risk-taking behavior and impulsive decision-making (Elvin et al., 2024). Neurobiological investigations have demonstrated that exaggerated reward responsivity contributes to sensation seeking, susceptibility to peer influence, and preference for immediate gratification, all of which are strongly associated with early substance experimentation (Sazhin et al., 2020). Substance use behaviors activate dopaminergic reward pathways and temporarily reduce emotional distress, thereby reinforcing repeated engagement and increasing the probability of dependence over time (Sinha, 2024). Furthermore, emerging evidence suggests that reward-processing abnormalities are not restricted to substance addiction alone but also characterize a broad range of behavioral addictions and compulsive risk-taking patterns among adolescents (Billieux

JAYPS Adolescent and Youth Psychological Studies E-ISSN: 2981-2526

et al., 2023). Similar biopsychosocial mechanisms have been identified in problematic gaming, binge eating, and maladaptive behavioral reinforcement cycles (Chang et al., 2023; Rojas-Jara et al., 2022). These converging findings indicate that reward sensitivity may represent a transdiagnostic vulnerability mechanism contributing to multiple maladaptive coping and addiction-related outcomes during adolescence.

Peer pressure also plays a critical role in shaping adolescent behavioral trajectories and substance use patterns. Adolescents are developmentally inclined toward peer acceptance, social belonging, and interpersonal validation, making them highly sensitive to social influence processes (Meier et al., 2021). Social reinforcement mechanisms often intensify experimentation with alcohol, tobacco, cannabis, and other substances, particularly within peer environments that normalize or encourage risky behaviors (Ćatović & Gudelj, 2021). Previous studies have shown that adolescents who perceive strong peer approval for substance use demonstrate significantly greater intentions to engage in drug-related behaviors and experience higher rates of repeated substance involvement (Bucklin, 2021). Peer influence may also amplify the impact of preexisting vulnerabilities such as trauma exposure, emotional dysregulation, and impulsivity by creating social contexts that reinforce maladaptive coping patterns (Borodulin & Holmberg, 2023). Importantly, the social neurobiology of adolescence suggests that reward-processing systems become particularly responsive to peer evaluation and social feedback during this developmental period, thereby increasing susceptibility to conformity-related risk behaviors (Sazhin et al., 2020). This interaction between peer pressure and reward sensitivity may represent a crucial probabilistic pathway underlying substance use vulnerability among youth.

Another factor receiving increasing attention in adolescent psychopathology research is sleep instability and nocturnal dysregulation. Sleep disturbances are highly prevalent among adolescents due to developmental, academic, technological, and psychosocial pressures, and growing evidence suggests that disrupted sleep patterns are strongly associated with emotional dysregulation, impulsive behavior, depression, and addiction vulnerability (Tubbs et al., 2022). Sleep instability has been linked to impaired cognitive control, heightened emotional reactivity, diminished decision-making capacity, and increased risk-taking tendencies, all of which contribute to maladaptive behavioral outcomes (Thapar et al., 2022). Recent investigations have demonstrated significant associations between poor sleep quality and opioid misuse, substance cravings, and relapse vulnerability among adolescents and young adults (Groenewald et al., 2025). Sleep disruption may also intensify stress sensitivity and interfere with adaptive coping processes, thereby increasing the probability of using psychoactive substances as a maladaptive regulation strategy (Magomedova & Fatima, 2025). Furthermore, nocturnal wakefulness and irregular circadian functioning appear to increase behavioral disinhibition and reduce emotional self-regulation during late-night periods, which may facilitate impulsive substance-related decision-making (Tubbs et al., 2022). Despite increasing recognition of these associations, sleep instability remains relatively underexplored within integrated computational models of adolescent substance use vulnerability.

Psychological inflexibility represents another central mechanism potentially underlying substance-related behaviors among youth. Psychological inflexibility refers to rigid emotional responding, experiential avoidance, cognitive fusion, and inability to engage in value-consistent action under conditions of stress or emotional discomfort. Adolescents who demonstrate elevated psychological inflexibility often struggle to tolerate distress, regulate negative affect, and adaptively process adverse emotional experiences (Harris, 2025). Such individuals may increasingly rely on external regulation strategies, including substance use, to avoid painful internal experiences or temporarily suppress emotional discomfort (Reese et al., 2021). Contemporary psychopathology models suggest that experiential avoidance constitutes a transdiagnostic process underlying anxiety disorders, depressive symptoms, behavioral addictions, self-harm, and substance misuse (Chiappini et al., 2025). Moreover, emotional rigidity may amplify the long-term effects of trauma exposure by impairing adaptive coping and reducing resilience capacity in stressful environments (Elisha & Shachaf-Friedman, 2025). Psychological inflexibility has also been linked to impulsivity, compulsive behaviors, and maladaptive reward-seeking patterns among adolescents and emerging adults (Mooney et al., 2023). Similar emotional and cognitive processes have been observed among individuals displaying addictive eating patterns, gaming disorder, and dysregulated emotional behaviors (Rodan et al., 2021; Sampedro-Piquero et al., 2022). These findings suggest that psychological inflexibility may function as a critical intermediary

JAYPS Adolescent and Youth Psychological Studies
E-ISSN: 2981-2526

mechanism connecting emotional adversity, reward dysfunction, peer influence, and substance use vulnerability.

The complexity of these interacting risk processes has encouraged increasing use of advanced computational and probabilistic analytical approaches in mental health research. Traditional linear statistical models often assume independence among predictors and may fail to capture the dynamic and conditional relationships underlying adolescent behavioral disorders (Rezapour et al., 2022). In contrast, Bayesian network modeling provides a flexible probabilistic framework capable of identifying directed dependency structures and conditional pathways among interconnected psychological variables. Bayesian approaches are particularly valuable in psychopathology research because they allow simultaneous examination of direct, indirect, and probabilistic influences among multiple determinants of behavior (Mansharamani et al., 2023). These models can estimate how combinations of vulnerabilities interact to increase or decrease the likelihood of maladaptive outcomes and can therefore provide clinically meaningful insights into risk stratification and prevention planning (Chang et al., 2023). Recent developments in neuroscience-informed prevention science have highlighted the importance of integrating biopsychosocial, behavioral, and neurocognitive variables within multidimensional analytical systems capable of modeling real-world complexity (Rezapour et al., 2022). Bayesian networks are especially useful for identifying latent dependency structures that may not emerge through conventional regression techniques.

The relevance of integrated probabilistic frameworks is further reinforced by evidence indicating substantial overlap between substance use vulnerability and broader dimensions of adolescent psychopathology. Emotional dysregulation, depressive symptoms, social disconnection, impulsivity, trauma exposure, and maladaptive coping patterns frequently co-occur within adolescent populations (Thapar et al., 2022). Contemporary models of youth mental health emphasize that psychopathological processes are deeply interconnected rather than isolated phenomena (Magomedova & Fatima, 2025). For example, stress-related disorders, emotional dysregulation, self-harm behaviors, and addictive patterns often share common neurobiological and cognitive mechanisms involving reward processing, avoidance learning, and impaired emotional regulation (Harris, 2025). Additionally, children of parents with addiction histories may develop maladaptive personality traits, emotional instability, and heightened stress sensitivity that increase later vulnerability to substance use disorders (Flykt et al., 2021; Mansharamani et al., 2023). Such findings suggest that adolescent substance use should be conceptualized within a broader network of developmental, emotional, interpersonal, and neurobehavioral risk systems rather than as an isolated behavioral outcome.

Although previous research has independently examined trauma exposure, reward sensitivity, peer pressure, sleep instability, and psychological inflexibility, relatively few studies have integrated these variables within a unified Bayesian probabilistic framework capable of modeling their conditional interactions and cumulative contributions to youth substance use risk. Much of the existing literature relies on traditional correlational or regression-based methodologies that do not adequately account for dynamic interdependencies among psychological variables (Belfiore et al., 2024). Furthermore, many prior investigations focus on single risk domains while neglecting the complex biopsychosocial interactions that characterize adolescent developmental vulnerability (Ramírez et al., 2025). Given the increasing prevalence of adolescent substance-related problems and the growing recognition of multidimensional psychopathology pathways, there is a critical need for computational models capable of identifying how emotional, social, neurobehavioral, and sleep-related factors interact probabilistically to shape substance use risk among youth.

Therefore, the aim of the present study was to develop and evaluate a Bayesian network model of youth substance use risk based on trauma exposure, reward sensitivity, peer pressure, sleep instability, and psychological inflexibility among adolescents and emerging adults in the United States.

2. Methods and Materials

2.1. Study Design and Participants

This study employed a cross-sectional predictive modeling design using Bayesian network analysis to investigate the probabilistic relationships among trauma exposure, reward sensitivity, peer pressure, sleep instability, psychological inflexibility, and substance use risk among adolescents and emerging adults in the United States. The study was designed within a data-driven computational psychiatry framework with the aim of identifying conditional dependencies and latent probabilistic pathways associated with youth vulnerability to substance use behaviors. The target population consisted of high school and early college students aged 15 to 22 years residing in four geographically diverse regions of the United States, including California, Texas, Illinois, and New York. Data

JAYPS Adolescent and Youth Psychological Studies
E-ISSN: 2981-2526

collection was conducted between September 2025 and February 2026 through a combination of school-based recruitment and secure online survey administration platforms. Written informed consent was obtained from participants aged 18 years and older, while parental consent and adolescent assent were obtained for participants under the age of 18.

The final sample consisted of 1,248 participants selected through multistage stratified sampling. Initially, public high schools, community colleges, and youth educational centers were randomly selected from urban and suburban districts within the targeted states. Subsequently, eligible students were invited to participate through counselor referrals, digital announcements, and classroom recruitment procedures. Inclusion criteria included being between 15 and 22 years of age, current enrollment in an educational institution, adequate English-language comprehension, and willingness to complete all study instruments. Exclusion criteria included severe cognitive impairment, active psychotic symptoms, or incomplete response patterns exceeding 15% of the questionnaire items. After data screening and removal of invalid or inattentive responses using response consistency indices and attention-check items, 1,248 complete datasets remained for final analysis. The sample included 52.1% females and 47.9% males, with a mean age of 18.37 years (SD = 2.11). Participants represented ethnically diverse backgrounds, including White American, African American, Hispanic/Latino, Asian American, and multiracial groups, thereby increasing the generalizability of the findings across diverse youth populations in the United States.

2.2. Measures

Youth substance use risk was assessed using the Substance Use Risk Profile Scale developed by Woicik and colleagues in 2009. The instrument is a widely used self-report measure designed to identify psychological and behavioral tendencies associated with vulnerability to alcohol and drug misuse among adolescents and young adults. The scale consists of 23 items rated on a 4-point Likert continuum ranging from strongly disagree to strongly agree. The measure evaluates dimensions associated with impulsivity, sensation seeking, anxiety sensitivity, and hopelessness, all of which contribute to elevated risk for substance involvement. Higher scores indicate greater susceptibility to substance-related behaviors and maladaptive coping strategies. Previous psychometric studies conducted in adolescent populations have demonstrated strong internal consistency coefficients ranging from 0.78 to 0.91 across subscales, as well as satisfactory convergent validity with clinical indicators of substance misuse and behavioral dysregulation. In the present study, Cronbach's alpha for the total scale was 0.88.

Trauma exposure was measured using the Childhood Trauma Questionnaire-Short Form developed by Bernstein and colleagues in 2003. This instrument contains 28 items assessing experiences of emotional abuse, physical abuse, sexual abuse, emotional neglect, and physical neglect during childhood and adolescence. Participants responded to items using a 5-point Likert scale ranging from never true to very often true. The questionnaire has been extensively validated in community and clinical populations and demonstrates strong factorial validity and temporal stability. Higher scores indicate greater cumulative trauma exposure and adverse developmental experiences. Prior research in American adolescent samples has reported internal consistency coefficients above 0.85 and significant associations with psychopathology, emotional dysregulation, and addiction vulnerability. In the current study, the overall reliability coefficient for the instrument was 0.91.

Reward sensitivity was assessed using the Behavioral Activation System subscale of the Behavioral Inhibition System/Behavioral Activation System Scales developed by Carver and White in 1994. The Behavioral Activation System dimension includes 13 items measuring responsiveness to reward cues, impulsive reward pursuit, and sensitivity to pleasurable experiences. Participants rated each statement on a 4-point scale from very false for me to very true for me. Higher scores reflect elevated reward responsiveness and increased motivational sensitivity to reinforcing stimuli. The instrument has demonstrated strong construct validity in studies examining adolescent impulsivity, substance experimentation, and risky behavior engagement. Previous research has shown reliability estimates ranging from 0.79 to 0.87 in youth populations. In the present study, Cronbach's alpha for the Behavioral Activation System subscale was 0.84.

Peer pressure was evaluated using the Peer Pressure Inventory developed by Brown, Clasen, and Eicher in 1986. The scale consists of 18 items assessing direct and indirect peer influence related to social conformity, risk-taking, and behavioral decision-making. Participants responded on a 5-point Likert scale ranging from never to always. Higher scores indicate greater susceptibility to peer influence and stronger perceived social pressure from peers. The

JAYPS Adolescent and Youth Psychological Studies
E-ISSN: 2981-2526

instrument has been frequently used in adolescent behavioral research and has shown strong predictive validity for substance use initiation, delinquency, and externalizing behaviors. Previous studies in American youth populations have reported reliability coefficients exceeding 0.80. In the current investigation, the scale demonstrated a Cronbach's alpha coefficient of 0.86.

Sleep instability was measured using the Sleep Condition Indicator developed by Espie and colleagues in 2014. This measure includes eight items assessing sleep continuity, sleep satisfaction, nighttime awakenings, and perceived sleep quality over the previous month. Responses are scored on a 5-point scale, with lower scores reflecting poorer sleep stability and more severe disturbances in sleep regulation. Because the present study focused on instability and irregularity of sleep patterns, reverse scoring procedures were implemented so that higher final scores represented greater sleep instability. The instrument has demonstrated excellent psychometric properties in adolescent and young adult populations, including strong convergent validity with insomnia severity and emotional dysregulation measures. In the current sample, the instrument yielded a reliability coefficient of 0.83.

Psychological inflexibility was assessed using the Acceptance and Action Questionnaire-II developed by Bond and colleagues in 2011. This 7-item instrument evaluates experiential avoidance, cognitive fusion, emotional rigidity, and inability to engage in value-consistent behavior during distress. Participants rated items on a 7-point Likert scale ranging from never true to always true. Higher scores indicate greater psychological inflexibility and maladaptive emotional avoidance processes. The questionnaire is widely used in acceptance and commitment therapy research and has shown strong associations with anxiety, depression, behavioral addiction, and maladaptive coping. Previous studies involving adolescent and emerging adult samples have reported Cronbach's alpha values between 0.84 and 0.90. In the present study, the scale demonstrated excellent reliability with an alpha coefficient of 0.89.

2.3. Data Analysis

Data analysis was conducted using a combination of traditional statistical procedures and Bayesian probabilistic modeling techniques. Initially, descriptive statistics including means, standard deviations, skewness, and kurtosis indices were calculated for all study variables to assess distributional characteristics and identify potential violations of normality assumptions. Missing data rates were below 3% across all variables and were handled using expectation-maximization imputation procedures. Pearson correlation analyses were subsequently conducted to examine preliminary associations among trauma exposure, reward sensitivity, peer pressure, sleep instability, psychological inflexibility, and substance use risk.

The primary analytical framework of the study involved Bayesian network modeling implemented using Python programming language and specialized machine learning libraries including pgmpy, Scikit-learn, NumPy, and NetworkX. Bayesian networks were selected because of their ability to model conditional probabilistic dependencies among psychological variables while simultaneously identifying direct and indirect pathways associated with substance use vulnerability. Prior to model estimation, all variables were standardized and discretized using entropy-based binning procedures to optimize network learning performance. Structural learning of the Bayesian network was conducted using the Hill-Climbing optimization algorithm combined with the Bayesian Information Criterion scoring function to identify the optimal directed acyclic graph representing the probabilistic structure of the data. Bootstrap resampling with 1,000 iterations was employed to enhance model stability and reduce the risk of overfitting.

To evaluate predictive accuracy, the dataset was randomly divided into training and testing subsets using an 80/20 split ratio. The Bayesian network model was trained on the training dataset and subsequently validated on the independent testing dataset. Model performance was evaluated using classification accuracy, precision, recall, F1-score, area under the receiver operating characteristic curve, and log-likelihood estimation. Sensitivity analysis was additionally conducted to determine the relative influence of each predictor variable on substance use risk probabilities within the network structure. Conditional probability queries were also implemented to estimate the likelihood of elevated substance use risk under varying combinations of trauma exposure, reward sensitivity, peer pressure, sleep instability, and psychological inflexibility. Network visualization procedures were performed to graphically illustrate probabilistic pathways and conditional dependencies among variables. All statistical analyses were conducted using SPSS version 29 and Python 3.11, with the significance threshold set at $p < .05$.

JAYPS Adolescent and Youth Psychological Studies
E-ISSN: 2981-2526

3. Findings and Results

A total of 1,248 adolescents and emerging adults participated in the present study. Of the participants, 650 individuals (52.1%) were female and 598 individuals (47.9%) were male. The age of participants ranged from 15 to 22 years, with a mean age of 18.37 years (SD = 2.11). Regarding educational status, 58.4% of participants were enrolled in high school programs, while 41.6% were attending community colleges or early undergraduate educational programs. Ethnic distribution indicated that 43.8% identified as White American, 21.4% as Hispanic/Latino, 18.6% as African American, 10.3% as Asian American, and 5.9% as multiracial or other ethnic backgrounds. Approximately 31.7% of the participants reported previous experimentation with at least one psychoactive substance, whereas 14.2% reported repeated substance use during the preceding six months. Preliminary screening analyses demonstrated acceptable distributional properties for all study variables, with skewness and kurtosis values remaining within the acceptable range of ±2.00, indicating the suitability of the data for Bayesian network estimation and multivariate statistical analyses.

Table 1

Descriptive Statistics and Correlations Among Study Variables

Variables	Mean	SD	1	2	3	4	5	6
1. Trauma Exposure	41.82	12.44	—					
2. Reward Sensitivity	35.19	7.86	.39**	—				
3. Peer Pressure	48.27	10.53	.42**	.46**	—			
4. Sleep Instability	24.91	6.78	.44**	.31**	.37**	—		
5. Psychological Inflexibility	29.76	8.64	.57**	.34**	.41**	.49**	—	
6. Substance Use Risk	51.43	11.92	.61**	.53**	.58**	.46**	.65**	—

The descriptive and correlational findings presented in Table 1 demonstrated significant positive associations among all study variables. Trauma exposure showed moderate-to-strong correlations with peer pressure ($r = .42$, $p < .01$), sleep instability ($r = .44$, $p < .01$), psychological inflexibility ($r = .57$, $p < .01$), and substance use risk ($r = .61$, $p < .01$), indicating that participants with elevated histories of adverse childhood experiences were more likely to exhibit maladaptive emotional and behavioral risk patterns. Reward sensitivity also displayed a strong positive relationship with substance use risk ($r = .53$, $p < .01$), suggesting that heightened responsiveness to rewarding stimuli may contribute substantially to vulnerability toward substance experimentation and impulsive behavior. Among all predictor variables, psychological inflexibility demonstrated the strongest correlation with substance use risk ($r = .65$, $p < .01$), highlighting the central role of experiential avoidance and emotional rigidity in the probabilistic structure of youth addiction vulnerability. Sleep instability exhibited moderate positive associations with all variables, particularly psychological inflexibility ($r = .49$, $p < .01$), supporting the notion that emotional dysregulation and disrupted sleep processes may interact dynamically within the broader psychopathological network associated with substance misuse. Overall, the correlation matrix revealed a highly interconnected psychological risk system suitable for Bayesian network modeling and probabilistic dependency estimation.

Table 2

Bayesian Network Model Performance Indices for Predicting Youth Substance Use Risk

Performance Indicator	Value
Training Accuracy	89.41%
Testing Accuracy	86.93%
Precision	0.87
Recall	0.85
F1-Score	0.86
Area Under ROC Curve (AUC)	0.91
Log-Likelihood	-1248.37
Bayesian Information Criterion (BIC)	2576.84
Sensitivity	0.84

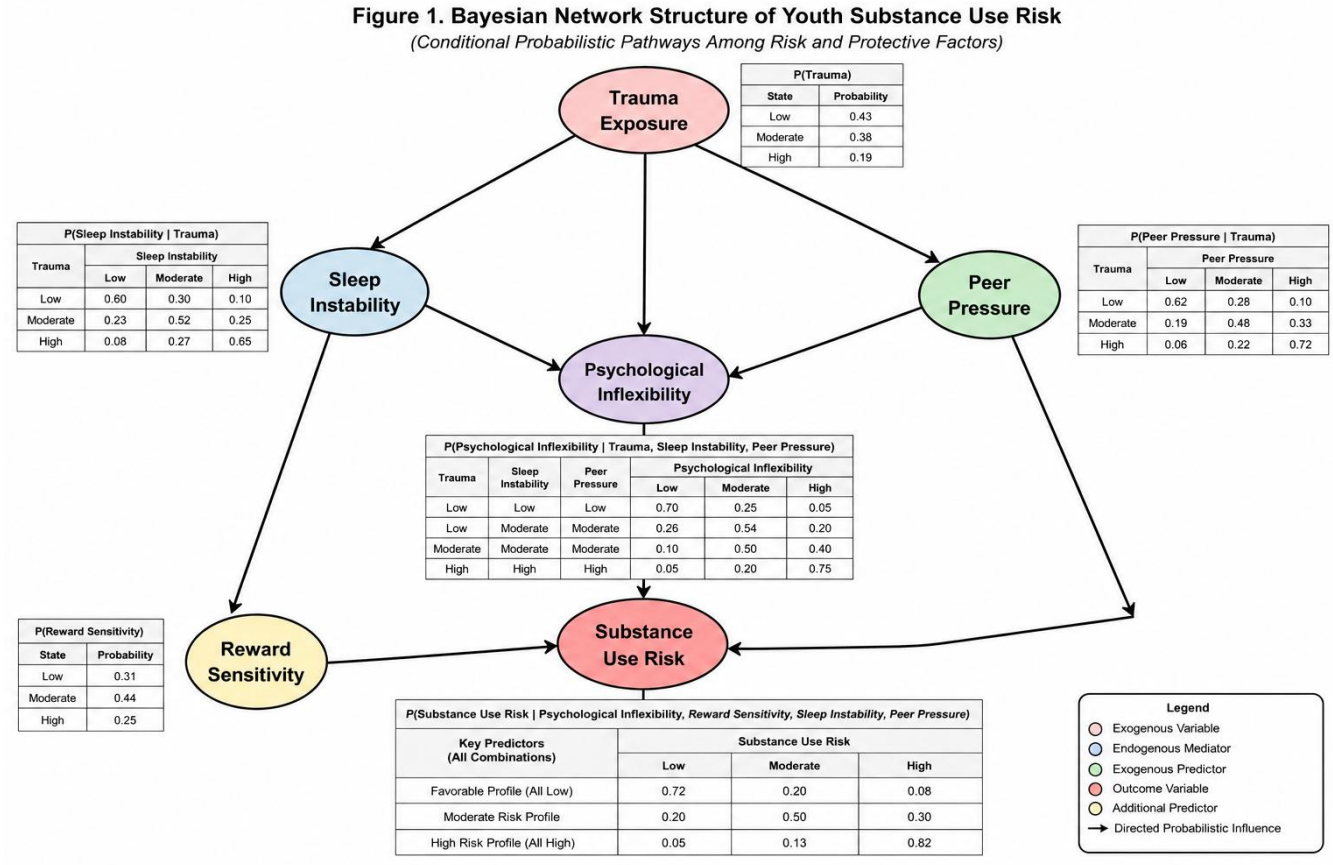
JAYPS Adolescent and Youth Psychological Studies
E-ISSN: 2981-2526

Specificity	0.88

The Bayesian network model demonstrated high predictive performance and strong classification capability in identifying youth substance use risk. As shown in Table 2, the model achieved a training accuracy of 89.41% and a testing accuracy of 86.93%, indicating strong generalizability and minimal overfitting between training and validation datasets. The area under the receiver operating characteristic curve reached 0.91, reflecting excellent discrimination capacity between high-risk and low-risk participants. Precision and recall coefficients were also high, suggesting that the model accurately identified adolescents with elevated substance use vulnerability while maintaining stable classification consistency across probabilistic thresholds. The F1-score of 0.86 further confirmed balanced predictive performance. Sensitivity and specificity analyses indicated that the model effectively captured true positive cases of substance use risk while simultaneously minimizing false-positive classifications. Examination of the Bayesian Information Criterion and log-likelihood statistics demonstrated acceptable model fit and structural efficiency, supporting the adequacy of the final directed acyclic graph generated through the Hill-Climbing optimization procedure. Collectively, these findings indicated that Bayesian probabilistic modeling provided a robust analytical framework for understanding complex interdependencies among trauma exposure, reward sensitivity, peer pressure, sleep instability, psychological inflexibility, and substance use vulnerability among adolescents and emerging adults.

Figure 1

Bayesian Network Structure Demonstrating Conditional Probabilistic Pathways Among Trauma Exposure, Reward Sensitivity, Peer Pressure, Sleep Instability, Psychological Inflexibility, and Youth Substance Use Risk



The Bayesian network structure revealed several important conditional dependency pathways contributing to youth substance use vulnerability. Trauma exposure emerged as a central upstream node directly influencing

JAYPS Adolescent and Youth Psychological Studies
E-ISSN: 2981-2526

psychological inflexibility, sleep instability, and peer pressure susceptibility. Psychological inflexibility functioned as the strongest intermediary node connecting trauma-related experiences to elevated substance use risk probabilities, indicating that adolescents with greater emotional rigidity and experiential avoidance demonstrated substantially higher conditional probabilities of maladaptive substance-related outcomes. Reward sensitivity also emerged as a highly influential predictor with direct probabilistic pathways toward substance use risk, suggesting that heightened reward responsiveness increased vulnerability to reinforcement-seeking behaviors and impulsive experimentation with psychoactive substances. Peer pressure demonstrated both direct and indirect effects within the network structure, amplifying the impact of reward sensitivity and trauma exposure on behavioral risk outcomes. Sleep instability appeared as an important secondary mediator interacting dynamically with psychological inflexibility and trauma exposure, indicating that disrupted sleep regulation may exacerbate emotional dysregulation and behavioral vulnerability processes. Conditional probability analyses demonstrated that participants exhibiting simultaneously high trauma exposure, elevated reward sensitivity, severe sleep instability, and strong psychological inflexibility showed an estimated 82% probability of belonging to the high substance use risk category. In contrast, adolescents with low trauma exposure and low psychological inflexibility demonstrated less than 18% probability of elevated substance use vulnerability. These probabilistic findings highlighted the multidimensional and interconnected nature of youth addiction risk and underscored the utility of Bayesian network modeling in identifying complex psychological dependency structures underlying adolescent substance-related behaviors.

Table 3

Relative Predictor Importance in the Bayesian Network Model of Youth Substance Use Risk

Predictor Variable	Relative Importance Weight	Standardized Influence Score
Psychological Inflexibility	0.31	1.00
Trauma Exposure	0.26	0.87
Peer Pressure	0.19	0.74
Reward Sensitivity	0.15	0.63
Sleep Instability	0.09	0.48

The sensitivity analysis and predictor importance estimation presented in Table 3 revealed that psychological inflexibility represented the most influential variable within the Bayesian network model, with the highest relative importance weight and standardized influence score. This finding suggested that cognitive fusion, experiential avoidance, and emotional rigidity constituted the most powerful probabilistic mechanisms underlying youth substance use vulnerability. Trauma exposure emerged as the second strongest predictor, indicating that adverse childhood experiences and developmental stressors exert substantial direct and indirect influences on addiction-related risk processes. Peer pressure demonstrated notable predictive influence, reinforcing the importance of social environmental mechanisms and interpersonal conformity pressures during adolescence and emerging adulthood. Reward sensitivity also contributed significantly to the prediction of substance use risk, although its influence was partially mediated through peer pressure and psychological inflexibility pathways within the network structure. Sleep instability displayed the lowest but still meaningful contribution to the model, suggesting that disrupted sleep patterns function as an auxiliary vulnerability factor that intensifies emotional dysregulation and maladaptive coping tendencies. Overall, the predictor ranking pattern highlighted the dominant role of psychological and trauma-related mechanisms within the probabilistic architecture of adolescent substance use vulnerability while simultaneously demonstrating the interactive contributions of behavioral, emotional, and social determinants.

4. Discussion

The present study aimed to develop and evaluate a Bayesian network model of youth substance use risk based on trauma exposure, reward sensitivity, peer pressure, sleep instability, and psychological inflexibility among adolescents and emerging adults in the United States. The findings demonstrated that all study variables were positively and significantly associated with substance use risk and that the Bayesian network model showed high

JAYPS Adolescent and Youth Psychological Studies
E-ISSN: 2981-2526

predictive accuracy and strong probabilistic classification performance. Among the predictor variables, psychological inflexibility emerged as the strongest contributor to substance use vulnerability, followed by trauma exposure, peer pressure, reward sensitivity, and sleep instability. Furthermore, the Bayesian network structure revealed that trauma exposure functioned as an upstream variable influencing psychological inflexibility, sleep instability, and peer pressure susceptibility, while psychological inflexibility served as the most influential intermediary pathway linking emotional adversity to elevated substance use risk. These findings support multidimensional models of adolescent psychopathology emphasizing the interactive and conditional nature of developmental risk processes.

One of the most important findings of the present study was the strong relationship between trauma exposure and youth substance use risk. Adolescents reporting higher levels of childhood adversity demonstrated substantially elevated probabilities of engaging in substance-related behaviors. This finding is highly consistent with previous research indicating that exposure to abuse, neglect, violence, and chronic stress disrupts emotional regulation systems and increases vulnerability to maladaptive coping mechanisms (Ramírez et al., 2025). Trauma experiences may impair neurodevelopmental pathways associated with stress regulation, emotional processing, and behavioral inhibition, thereby increasing the likelihood of seeking relief through psychoactive substances (Adindu et al., 2024). The findings are also aligned with evidence suggesting that traumatized adolescents frequently experience heightened emotional distress, shame, social isolation, and internal dysregulation, all of which contribute to addictive coping behaviors (Powell, 2021). Furthermore, Rizk-Hildbrand and colleagues emphasized that experiences of violence, body shaming, and emotional suffering in adolescence may intensify self-destructive coping patterns and behavioral dysregulation (Rizk-Hildbrand et al., 2025). The current findings therefore reinforce the importance of conceptualizing substance use risk as partially rooted in developmental adversity and unresolved emotional trauma.

Another significant finding was the strong predictive role of psychological inflexibility within the Bayesian network model. Psychological inflexibility emerged as the most influential variable predicting substance use risk, suggesting that adolescents who struggle to tolerate distress and regulate painful emotional experiences are more likely to engage in maladaptive substance-related behaviors. This finding supports contemporary acceptance-based and transdiagnostic psychopathology models emphasizing experiential avoidance and cognitive rigidity as central mechanisms underlying addiction vulnerability (Reese et al., 2021). Adolescents with elevated psychological inflexibility may attempt to escape or suppress distressing internal experiences through external regulation strategies such as alcohol and drug use. The findings are also supported by Harris, who argued that maladaptive emotional prediction systems and impaired adaptive regulation processes contribute significantly to depression, stress disorders, and compulsive behavioral responses (Harris, 2025). Similarly, Chiappini and colleagues reported that emerging psychopathological conditions among adolescents frequently involve rigid emotional responding, maladaptive coping, and impaired cognitive flexibility (Chiappini et al., 2025). The present findings also align with studies examining addiction-related disorders and behavioral dysregulation, which indicate that emotional rigidity and avoidance processes are strongly associated with relapse vulnerability, compulsive behavior, and maladaptive reward seeking (Mooney et al., 2023). Therefore, psychological inflexibility may function as a critical mechanism transforming emotional distress into behavioral addiction vulnerability.

The findings additionally demonstrated that reward sensitivity significantly contributed to youth substance use risk. Adolescents with heightened reward responsiveness displayed increased vulnerability to substance-related behaviors and impulsive reinforcement-seeking patterns. This finding is consistent with developmental neuroscience literature emphasizing that adolescence is characterized by heightened activation of reward-processing systems alongside relatively immature executive control mechanisms (Ma, 2026). Elevated reward sensitivity may increase susceptibility to novelty seeking, sensation seeking, and immediate gratification, thereby increasing the reinforcing effects of psychoactive substances (Sazhin et al., 2020). Previous investigations have similarly demonstrated that reward-processing abnormalities contribute not only to substance addiction but also to behavioral addictions such as problematic gaming and binge-related disorders (Billieux et al., 2023; Rojas-Jara et al., 2022). Moreover, Chang and colleagues found that maladaptive reward responsiveness and impulsive motivational systems play central roles in behavioral addiction vulnerability among adolescents (Chang et al., 2023). The present findings also correspond with Sinha's stress-addiction framework, which suggests that stress-related emotional dysregulation increases

JAYPS Adolescent and Youth Psychological Studies E-ISSN: 2981-2526

sensitivity to rewarding stimuli and reinforces substance use behaviors as compensatory coping strategies (Sinha, 2024). Thus, reward sensitivity appears to represent a biologically and psychologically significant pathway contributing to adolescent substance use risk.

Peer pressure also emerged as an important predictor within the Bayesian network model. Adolescents who reported greater susceptibility to peer influence demonstrated higher probabilities of substance use vulnerability. This finding is strongly supported by social-developmental theories emphasizing the critical role of peer acceptance, social belonging, and conformity pressures during adolescence (Meier et al., 2021). During this developmental stage, peer approval becomes highly rewarding, and adolescents may increasingly engage in risky behaviors to maintain social status and interpersonal acceptance. Previous studies have consistently shown that peer environments strongly influence adolescent experimentation with alcohol, nicotine, and illicit substances (Ćatović & Gudelj, 2021). The current findings are also aligned with research suggesting that peer influence amplifies preexisting emotional and behavioral vulnerabilities such as impulsivity, trauma-related distress, and reward sensitivity (Borodulin & Holmberg, 2023). Furthermore, Bucklin's multidimensional framework for understanding addictive behaviors highlighted the importance of interpersonal reinforcement mechanisms and environmental triggers in shaping substance-related decision-making (Bucklin, 2021). The Bayesian network structure in the present study additionally demonstrated that peer pressure interacted with trauma exposure and psychological inflexibility, suggesting that social influence processes may intensify underlying emotional vulnerabilities and increase the probability of maladaptive coping behaviors.

Sleep instability was another significant contributor to substance use vulnerability within the model. Adolescents with greater sleep disruption and irregular sleep patterns demonstrated elevated substance use risk probabilities. This finding supports growing evidence linking sleep deficiency with emotional dysregulation, impulsive behavior, and psychopathology during adolescence (Tubbs et al., 2022). Sleep instability may impair cognitive control functions and increase emotional reactivity, thereby reducing adolescents' ability to regulate impulses and cope adaptively with stress. The findings are highly consistent with Groenewald and colleagues, who demonstrated significant associations between sleep deficiency and opioid-related vulnerability among adolescents (Groenewald et al., 2025). Similarly, Thapar and colleagues emphasized that sleep dysregulation contributes substantially to depression, emotional instability, and behavioral dysfunction in young people (Thapar et al., 2022). Poor sleep may also increase stress sensitivity and emotional exhaustion, thereby enhancing the reinforcing appeal of psychoactive substances as temporary relief mechanisms (Magomedova & Fatima, 2025). Importantly, the Bayesian network structure indicated that sleep instability interacted dynamically with psychological inflexibility and trauma exposure, suggesting that disrupted sleep may function both as a direct vulnerability factor and as a secondary amplifier of emotional dysregulation processes.

The probabilistic structure identified through Bayesian network modeling represents another major contribution of the present study. Traditional statistical approaches often assume independent effects among predictors and may fail to capture the interconnected nature of adolescent psychopathology. In contrast, the Bayesian framework used in this study successfully identified conditional pathways linking trauma exposure, emotional rigidity, peer influence, reward sensitivity, and sleep instability to substance use vulnerability. These findings support neuroscience-informed and systems-based approaches emphasizing that adolescent behavioral disorders emerge from complex biopsychosocial interactions rather than isolated determinants (Rezapour et al., 2022). The present results are also consistent with Belfiore and colleagues, who highlighted the necessity of integrating biological, psychological, and social determinants when examining substance use disorders and co-occurring mental health conditions (Belfiore et al., 2024). Similarly, Borodulin and Holmberg argued that genetic, environmental, and sociocultural influences interact dynamically to shape addiction vulnerability across development (Borodulin & Holmberg, 2023). The Bayesian network findings therefore reinforce the value of probabilistic computational models for understanding adolescent substance use risk and identifying clinically meaningful intervention targets.

5. Conclusion

The findings also support broader transdiagnostic perspectives suggesting overlap between substance use vulnerability and other forms of emotional and behavioral dysregulation. Several prior studies have documented associations between addiction-related behaviors and

JAYPS Adolescent and Youth Psychological Studies
E-ISSN: 2981-2526

emotional instability, maladaptive coping, impulsivity, and compulsive reinforcement processes (Sampedro-Piquero et al., 2022). Similar biopsychosocial mechanisms have been identified in behavioral addictions, eating disorders, depressive disorders, and self-harming behaviors (Chiappini et al., 2025; Rodan et al., 2021). Furthermore, adolescents exposed to parental addiction and family dysfunction may develop maladaptive personality traits and emotional vulnerabilities that increase later addiction susceptibility (Flykt et al., 2021; Mansharamani et al., 2023). The interconnected pathways identified in the present study therefore support multidimensional developmental psychopathology models emphasizing that youth substance use risk reflects broader emotional, cognitive, and social dysregulation processes.

6. Limitations & Suggestions

One limitation of the present study was the cross-sectional design, which restricts causal interpretation of the identified relationships among trauma exposure, psychological inflexibility, peer pressure, reward sensitivity, sleep instability, and substance use risk. Although Bayesian network modeling provides valuable probabilistic insights into conditional dependencies among variables, longitudinal studies are necessary to determine developmental sequencing and causal directionality. Another limitation involved reliance on self-report measures, which may increase the possibility of recall bias, response distortion, or social desirability effects. Additionally, although the sample was geographically diverse within the United States, the findings may not generalize fully to adolescents from different cultural, socioeconomic, or clinical populations. The study also focused primarily on psychological and behavioral predictors and did not include biological markers, neuroimaging indicators, or family-system variables that may further enhance probabilistic modeling accuracy.

Future research should employ longitudinal and prospective study designs to examine how trauma exposure, emotional dysregulation, reward sensitivity, and sleep instability interact over time to influence substance use trajectories during adolescence and emerging adulthood. Additional studies could integrate neurobiological and physiological indicators such as cortisol regulation, neural reward responsivity, and genetic vulnerability markers into Bayesian computational models to improve prediction precision. Researchers are also encouraged to examine protective factors including resilience, family cohesion, mindfulness, emotional intelligence, and social support in order to identify adaptive mechanisms capable of buffering addiction vulnerability. Comparative investigations across cultures and socioeconomic contexts may further clarify the role of environmental and contextual factors in shaping adolescent substance use risk. Future studies could additionally compare Bayesian networks with alternative machine learning approaches such as random forests, deep learning models, and ensemble methods to evaluate relative predictive effectiveness across diverse adolescent populations.

The findings of the present study have important practical implications for mental health professionals, school counselors, prevention specialists, and public health policymakers. Prevention programs targeting adolescent substance use should adopt multidimensional approaches addressing trauma-related distress, emotional regulation deficits, sleep problems, maladaptive peer environments, and psychological inflexibility simultaneously rather than focusing exclusively on substance-related behaviors. School-based interventions may benefit from incorporating emotional regulation training, trauma-informed care principles, peer resistance skills, and sleep hygiene education into adolescent mental health programming. Clinicians working with high-risk youth should assess experiential avoidance, emotional rigidity, and trauma histories as part of comprehensive substance use screening procedures. The probabilistic findings of the Bayesian model may also assist practitioners in identifying adolescents with particularly elevated vulnerability profiles and implementing early personalized interventions before addiction patterns become chronic. Finally, policymakers should prioritize integrated youth mental health services that address emotional adversity, social risk factors, and behavioral dysregulation collectively in order to reduce the long-term burden of adolescent substance misuse and associated psychosocial outcomes.

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.

JAYPS Adolescent and Youth Psychological Studies
E-ISSN: 2981-2526

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

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

Authors' Contributions

All authors equally contributed to this article.

References

Adindu, K. N., Ajah, O. N., Ayowale, K. S., Onochie, E. D., Enemuo, N. R., & Okorie, C. D. (2024). Neuroscientific Approaches to Understanding Adolescent Susceptibility to Substance Abuse. *International Neuropsychiatric Disease Journal*, *21*(6), 73-80. https://doi.org/10.9734/indj/2024/v21i6455

Akunna, G. G., & Lucyann, C. A. (2023). Nigeria's War Against Drug Abuse: Prevalence, Patterns, Ramifications, Policy and Multisectoral Response, Strategies and Solutions. *Studies in Social Science & Humanities*, *2*(10), 35-55. https://doi.org/10.56397/sssh.2023.10.06

Belfiore, C. I., Galofaro, V., Cotroneo, D., Lopis, A., Tringali, I., Denaro, V., & Casu, M. (2024). A Multi-Level Analysis of Biological, Social, and Psychological Determinants of Substance Use Disorder and Co-Occurring Mental Health Outcomes. *Psychoactives*, *3*(2), 194-214. https://doi.org/10.3390/psychoactives3020013

Billieux, J., Bloch, J., Rochat, L., Fournier, L., Eben, C., Khazaal, Y., Simón, O., Andersen, M. M., King, D. L., & Lieberoth, A. (2023). 8th International Conference on Behavioral Addictions (ICBA 2023) August 23–25, 2023 Incheon, South Korea. *Journal of Behavioral Addictions*, *12*(Supplement-1), 1-365. https://doi.org/10.1556/2006.2023.00800

Borodulin, N., & Holmberg, J. (2023). How Genetic and Sociocultural Factors Interact With Mental Health Disorders and Epigenetics to Predispose and Reinforce Substance Use Disorder. *Journal of Student Research*, *12*(3). https://doi.org/10.47611/jsrhs.v12i3.5095

Bucklin, M. (2021). A 5-Factor Framework for Assessing Tobacco Use Disorder. *Tobacco Use Insights*, *14*. https://doi.org/10.1177/1179173x21998355

Ćatović, A., & Gudelj, K. (2021). Characteristics of Psychoactive Substances Consumption Among Students of First and Fifth Year of Faculty of Medicine of Sarajevo University. *GSC Advanced Research and Reviews*, *06*(03), 181-187. https://doi.org/10.30574/gscarr.2021.6.3.0058

Chang, R. S., Lee, M., Im, J. J., Choi, K. H., Kim, J., Chey, J., Shin, S.-H., & Ahn, W. Y. (2023). Biopsychosocial Factors of Gaming Disorder: A Systematic Review Employing Screening Tools With Well-Defined Psychometric Properties. *Frontiers in Psychiatry*, *14*. https://doi.org/10.3389/fpsyt.2023.1200230

Chiappini, S., Sampogna, G., Ventriglio, A., Menculini, G., Ricci, V., Pettorruso, M., Volpe, U., & Martinotti, G. (2025). Exploring Emerging Psychopathological Characteristics and Challenges of Novel Depression Subtypes: Insights From the Literature. *Frontiers in Psychiatry*, *16*. https://doi.org/10.3389/fpsyt.2025.1613251

Elisha, E., & Shachaf-Friedman, E. (2025). The Wounded Healer Paradox: Perceived Triggers of Drug Relapse and Recovery Among Peer Supporters. https://doi.org/10.21203/rs.3.rs-6517733/v1

Elvin, O. M., Modecki, K. L., & Waters, A. M. (2024). An Expanded Conceptual Framework for Understanding Irritability in Childhood: The Role of Cognitive Control Processes. *Clinical Child and Family Psychology Review*, *27*(2), 381-406. https://doi.org/10.1007/s10567-024-00489-0

Flykt, M., Salo, S., & Pajulo, M. (2021). "A Window of Opportunity": Parenting and Addiction in the Context of Pregnancy. *Current Addiction Reports*, *8*(4), 578-594. https://doi.org/10.1007/s40429-021-00394-4

Groenewald, C. B., Palermo, T. M., Rabbitts, J. A., Flack, R. L., & Kreider, S. L. (2025). Teens and Opioids Postsurgery (TOPS): Protocol for a Prospective Observational Study Describing Associations Between Sleep Deficiency and Opioid Use Following Outpatient Surgery in Adolescents. *BMJ open*, *15*(4), e099679. https://doi.org/10.1136/bmjopen-2025-099679

Harris, H. W. (2025). Active Inference and Psychodynamics: A Novel Integration With Applications to Depression and Stress Disorders. *Frontiers in Psychiatry*, *16*. https://doi.org/10.3389/fpsyt.2025.1630858

Igunma, C. H., Ohaeri, B., Ojo, I. O., & Babarimisa, O. (2022). Risk Factors Associated With Substance Abuse Among Adolescents. *International Neuropsychiatric Disease Journal*, 11-24. https://doi.org/10.9734/indj/2022/v18i130214

Ma, H. (2026). Reward Reactivity in Non-Suicidal Self-Injury in Adolescents: Protocol for a Longitudinal Study. https://doi.org/10.21203/rs.3.rs-8267494/v1

Magomedova, A., & Fatima, G. (2025). Mental Health and Well-Being in the Modern Era: A Comprehensive Review of Challenges and Interventions. *Cureus*. https://doi.org/10.7759/cureus.77683

Mansharamani, H., Mansharamani, B., Behere, P. B., Nagdive, A., & Mansharamani, D. (2023). Personality Traits in Children Of Alcoholic Parents. https://doi.org/10.5772/intechopen.106961

Meier, I. M., Honk, J. v., Bos, P. A., & Terburg, D. (2021). A Mu-Opioid Feedback Model of Human Social Behavior. *Neuroscience & Biobehavioral Reviews*, *121*, 250-258. https://doi.org/10.1016/j.neubiorev.2020.12.013

Mooney, A., Crafti, N., & Broadbear, J. H. (2023). Borderline Personality Disorder, Substance Abuse and Disordered Eating: Perceptions of Treatment and Recovery Within Community Mental Health. *The Journal of Mental Health Training Education and Practice*, *18*(6), 377-396. https://doi.org/10.1108/jmhtep-01-2022-0003

Nath, A., Choudhari, S. G., Dakhode, S. U., Rannaware, A., & Gaidhane, A. (2022). Substance Abuse Amongst Adolescents: An Issue of Public Health Significance. *Cureus*. https://doi.org/10.7759/cureus.31193

JAYPS Adolescent and Youth Psychological Studies
E-ISSN: 2981-2526

Powell, C. (2021). Caring for the Psychosocial Needs of the Acutely Traumatized Patient. *Jaapa*, *34*(11), 24-29. https://doi.org/10.1097/01.jaa.0000794980.31616.fa

Ramírez, M., Ugedo, A., Fañanás, L., Cano-Escalera, G., Sáiz, P. A., Zorrilla, E. P., & González-Pinto, A. (2025). Scoping Review of Biological and Psychosocial Pathways That Lead From Childhood Adversity to Early-Onset Substance Use. *Frontiers in Psychiatry*, *16*. https://doi.org/10.3389/fpsyt.2025.1612494

Reese, S. E., Conradt, E., Riquino, M. R., & Garland, E. L. (2021). An Integrated Mechanistic Model of Mindfulness-Oriented Recovery Enhancement for Opioid-Exposed Mother–Infant Dyads. *Frontiers in psychology*, *12*. https://doi.org/10.3389/fpsyg.2021.688359

Rezapour, T., Rafei, P., Baldacchino, A., Conrod, P., Dom, G., Fishbein, D., Kazemi, A., Hendriks, V. M., Newton, N. C., Riggs, N. R., Squeglia, L. M., Teesson, M., Vassileva, J., Verdejo-García, A., & Ekhtiari, H. (2022). Neuroscience-Informed Classification of Prevention Interventions in Substance Use Disorders: An RDoC-based Approach. https://doi.org/10.1101/2022.09.28.22280342

Rizk-Hildbrand, M., Semple, T. J., Preisig, M., Haeberling, I., Smigielski, L., Pauli, D., Walitza, S., Kleim, B., & Berger, G. (2025). The Body as a Battleground: A Qualitative Study of the Impact of Violence, Body Shaming, and Self-Harm in Adolescents With a History of Suicide Attempts. *International journal of environmental research and public health*, *22*(6), 859. https://doi.org/10.3390/ijerph22060859

Rodan, S.-C., Aouad, P., McGregor, I. S., & Maguire, S. (2021). Psilocybin as a Novel Pharmacotherapy for Treatment-Refractory Anorexia Nervosa. *OBM Neurobiology*, *05*(02), 1-25. https://doi.org/10.21926/obm.neurobiol.2102102

Rojas-Jara, C., Polanco-Carrasco, R., Navarro-Castillo, R., Faúndez-Castillo, F., & Chamorro-Gallardo, M. (2022). "Game (Not) Over": A Systematic Review of Video Game Disorder in Adolescents. *Revista Colombiana de Psicología*, *31*(2), 45-64. https://doi.org/10.15446/rcp.v31n2.90741

Sampedro-Piquero, P., Zancada-Menéndez, C., Brotóns, E. B., & Moreno-Fernández, R. D. (2022). The Relationship Between Binge Drinking and Binge Eating in Adolescence and Youth: A Systematic Review and Meta-Analysis. *International journal of environmental research and public health*, *20*(1), 232. https://doi.org/10.3390/ijerph20010232

Sarkingobir, Y., & Tukur, U. (2024). Effects of Drug Abuse on Primary Education: An Overview Context. *Jurnal Riset Madrasah Ibtidaiyah (Jurmia)*, *4*(1), 85-95. https://doi.org/10.32665/jurmia.v4i1.2791

Sazhin, D., Frazier, A. M., Haynes, C. R., Johnston, C., Chat, I. K., Dennison, J. B., Bart, C. P., McCloskey, M. E., Chein, J., Fareri, D. S., Alloy, L. B., Jarcho, J. M., & Smith, D. V. (2020). The Role of Social Reward and Corticostriatal Connectivity in Substance Use. *Journal of Psychiatry and Brain Science*. https://doi.org/10.20900/jpbs.20200024

Sinha, R. (2024). Stress and Substance Use Disorders: Risk, Relapse, and Treatment Outcomes. *Journal of Clinical Investigation*, *134*(16). https://doi.org/10.1172/jci172883

Thapar, A., Eyre, O., Patel, V., & Brent, D. A. (2022). Depression in Young People. *The lancet*, *400*(10352), 617-631. https://doi.org/10.1016/s0140-6736(22)01012-1

Tubbs, A., Fernandez, F. X., Grandner, M. A., Perlis, M. L., & Klerman, E. B. (2022). The Mind After Midnight: Nocturnal Wakefulness, Behavioral Dysregulation, and Psychopathology. *Frontiers in Network Physiology*, *1*. https://doi.org/10.3389/fnetp.2021.830338

JAYPS Adolescent and Youth Psychological Studies
E-ISSN: 2981-2526