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Between Experimentation and Addiction: Psychological and Social Factors Explaining the Abuse of Chemical Alternatives among Adolescents

بين التجريب والإدمان : العوامل النفسية والاجتماعية المفسرة لتعاطي البدائل الكيميائية لدى المراهقين

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Article abstract:

This study examined the psychological and social factors associated with the use of chemical alternatives among adolescents. A descriptive–analytical approach was employed, and data were collected using a questionnaire administered to a sample of 82 students aged 12–18 years from middle and secondary schools. The results indicated that use is mainly associated with peer influence, weak parental supervision, high impulsivity, and easy access to these substances. It often begins as experimentation and may progress to addiction, with glue, gasoline, paint, and correction fluid being the most commonly used substances.

Key words : *addiction ; chemical alternatives; drugs; adolescents*

ملخص المقال :

هدفت هذه الدراسة إلى فحص العوامل النفسية والاجتماعية المفسرة لتعاطي البدائل الكيميائية (المواد المتطايرة والمذيبات) لدى المراهقين، من أجل الإجابة على تساؤلات الدراسة تم الاعتماد على المنهج الوصفي التحليلي ، وتم تطبيق استمارة لجمع البيانات. على عينة من 82 تلميذًا من تلاميذ راوحت أعمارهم بين 12 و18 سنة، منهم 32 تلميذًا من التعليم المتوسط و50 من التعليم الثانوي. وأظهرت النتائج أن تعاطي البدائل الكيميائية بين المراهقين يرتبط أساسًا بعوامل نفسية واجتماعية متداخلة؛ أبرزها تأثير الرفاق، ضعف الرقابة الأبوية، الاندفاعية العالية، إضافة إلى توفر المواد وسهولة الوصول إليها. كما بينت البيانات أن استخدام هذه المواد غالبًا ما يبدأ في إطار التجريب، الذي قد يشكل مدخلًا إلى الإدمان الفعلي. وتعد المواد الأكثر استعمالًا بين أفراد العينة هي: الغراء، البنزين، الطلاء، والقلم المصحح.

الكلمات المفتاحية : الإدمان، البدائل الكيميائية، المخدرات، المراهقين.

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Introduction

Substance use among adolescents has become a growing public health concern worldwide because of its profound effects on physical health, mental well-being, academic achievement, and social functioning. According to the United Nations Office on Drugs and Crime (UNODC, 2024), adolescence represents a particularly vulnerable developmental stage during which experimentation with psychoactive substances is associated with an increased risk of substance use disorders and other high-risk behaviors. Although illicit drugs remain a major focus of prevention programs, increasing attention has recently been directed toward the misuse of readily available household and industrial chemicals as psychoactive substitutes, particularly among adolescents living in socioeconomically vulnerable settings where access to illicit drugs is often limited.

Drugs are natural or synthetic chemical substances that act on the central nervous system, altering cognitive, emotional, and behavioral functions. When repeatedly misused, these substances may lead to dependence and a wide range of adverse physical, psychological, and social consequences (World Health Organization, 2022). Addiction is generally characterized by compulsive substance seeking and continued use despite harmful consequences, often accompanied by psychological and, in some cases, physical dependence. Individuals may also develop dependence on more than one psychoactive substance simultaneously (Kramer & Cameron, 1975).

Although cannabis and other illicit psychoactive substances remain the most frequently discussed drugs in prevention programs, many adolescents increasingly resort to readily available chemical substitutes when access to conventional illicit drugs is limited because of financial constraints or restricted availability. These substitutes include household and industrial products such as glues, gasoline, paint thinners, and other volatile solvents containing psychoactive compounds. When intentionally inhaled at high concentrations, these substances rapidly produce psychoactive effects, including euphoria and altered perception, which explains their growing misuse among adolescents (Beckley & Woodward, 2013).

The chemical substitutes most frequently used by adolescents consist primarily of volatile organic compounds that pose significant neurological and systemic health risks. Commonly misused products include glues containing toluene or hexane, gasoline containing benzene, toluene, and hexane, paint thinners containing toluene and xylene, and correction fluids containing 1,1,1-trichloroethane. Among these substances, toluene has been consistently identified as the most frequently misused because of its rapid neuropsychoactive effects and high abuse potential (Lubman, Yücel, & Lawrence, 2008). The widespread availability of these products in domestic and commercial environments further facilitates experimentation among adolescents, underscoring the need for targeted prevention strategies

Although the misuse of inhalants and volatile substances has attracted increasing international attention over the past decade, most empirical evidence originates from high-income countries. Patterns of substance availability, family supervision, school environments, and broader sociocultural influences differ considerably across countries, limiting the generalizability of previous findings to developing settings. Recent international reports have emphasized that psychoactive substance use among adolescents remains a major public health concern and have highlighted the need for context-specific studies capable of identifying psychological and social determinants that vary across cultural environments and can inform evidence-based prevention and early intervention strategies (UNODC, 2024; WHO, 2024).

Previous research consistently suggests that the misuse of volatile substances is a multifactorial phenomenon involving neurobiological, psychological, and social mechanisms. Beckley and Woodward (2013) demonstrated that volatile solvents possess a high addictive potential because of their effects on neural pathways involved in reward and addiction. Complementing this neurobiological perspective, Nakawaki and Crano (2015) emphasized that early experimentation is largely facilitated by curiosity, easy accessibility, peer influence, and insufficient parental supervision. Similarly, Perron et al. (2009) reported that progression from experimentation to regular use or dependence is associated with early initiation, polysubstance use, and co-occurring mental health conditions such as anxiety and depression.

Together, these findings indicate that adolescent inhalant use results from the interaction of biological vulnerability with psychosocial and environmental influences rather than from a single isolated factor.

Overall, previous research consistently indicates that inhalant use cannot be explained by a single determinant; rather, it results from the interaction between individual psychological vulnerability and broader social and environmental influences. Nevertheless, previous studies have reported variations in the relative contribution of these factors across different cultural and educational contexts, suggesting that findings obtained in one setting cannot be directly generalized to another. Consequently, further empirical evidence is required from underrepresented sociocultural contexts to better understand the mechanisms underlying adolescents' use of chemical substitutes.

Despite the growing body of literature on adolescent substance use, empirical studies specifically addressing the use of chemical substitutes in Arab countries remain limited. Furthermore, little is known about whether the psychological and social determinants identified in previous international studies adequately explain this behavior among Algerian adolescents. This gap highlights the need for context-specific evidence capable of informing culturally appropriate prevention and intervention strategies.

Beyond the psychological and social determinants discussed above, the misuse of inhalants also poses serious health risks for adolescents. Because these products are rapidly absorbed through the lungs, they produce immediate psychoactive effects by acting on the central nervous system. However, repeated or high-dose exposure may result in severe complications, including loss of consciousness, hypoxia, cardiac arrhythmias, and, in some cases, sudden death. Their low cost, widespread availability, and legal accessibility make inhalants particularly attractive to adolescents and may facilitate progression from experimental use to more persistent patterns of substance misuse (Medscape, 2023).

Addressing this gap, the present study provides empirical evidence from the Algerian context by identifying the chemical substances most frequently used as psychoactive substitutes and examining the combined influence of psychological and social factors associated with their use among adolescents.

This study aims to identify the chemical substances most commonly used as psychoactive alternatives among adolescents and to compare patterns of use between middle and high school students. It further examines the psychological and social factors associated with the use of these substances, with particular attention to the roles of family, school, peer influence, and individual psychological characteristics. By addressing these dimensions simultaneously, the study seeks to provide a more comprehensive understanding of the factors associated with adolescents' use of chemical substitutes.

This study contributes to the existing literature by providing empirical evidence on the use of chemical substitutes among Algerian adolescents, a population that has received limited attention in previous research. By examining the interaction between psychological and social correlates, it expands current understanding of the factors associated with this behavior and provides a basis for future investigations in educational and clinical psychology.

From a practical perspective, the findings may assist mental health professionals, educators, and public health practitioners in developing culturally appropriate prevention and early intervention programs. They may also support school-based awareness initiatives and contribute to evidence-informed strategies aimed at reducing adolescents' engagement in high-risk substance use behaviors.

The study addressed the following research questions:

- What substances are used as alternatives to psychoactive drugs among adolescents ?
- Are there differences in the use of these substances between middle and high school students ?
- What psychological and social factors are associated with adolescents' engagement in such practices?

1. Methodology and Instruments

1.1 Research Method:

This study adopted a descriptive cross-sectional design to investigate the use of chemical substitutes among adolescents and to examine the psychological and social factors associated with this behavior. This design was considered appropriate because it allows the description of patterns of substance use, the identification of the most commonly used chemical substitutes, and the comparison of responses between middle and high school students without manipulating the study variables. Furthermore, the descriptive approach is well suited for exploring behavioral phenomena in their natural context and for providing empirical evidence that may inform future preventive and intervention strategies.

1.2 .Study Sample

The study sample consisted of 82 adolescents aged between 12 and 18 years, including 32 middle school students and 50 high school students. Participants were recruited using a convenience sampling method from schools that agreed to participate in the study. This sampling strategy was adopted because of the exploratory nature of the research and the practical challenges associated with data collection on a highly sensitive topic. Access to additional schools was limited, as some educational institutions declined participation because of concerns regarding the sensitive nature of the study and the collection of information related to substance use. Consequently, the final sample was drawn from the schools that granted permission to conduct the research. Although the relatively small sample size limits the generalizability of the findings, it provides valuable preliminary evidence regarding the use of chemical substitutes among adolescents and the psychological and social factors associated with this behavior.

1.3 .Research Instruments

Data were collected using a researcher-developed questionnaire designed specifically for the purposes of the present study after reviewing the relevant literature on adolescent substance use and the misuse of chemical substitutes. The questionnaire was intended to collect descriptive information rather than to measure a latent psychological construct. It comprised three sections: (1) demographic information (e.g., age and educational level); (2) questions concerning the use of chemical substitutes, including the types of substances used, patterns of use, and the prevalence of these behaviors within the school environment; and (3) questions exploring psychological and social circumstances associated with substance use, such as peer influence, family supervision, and motives reported by participants.

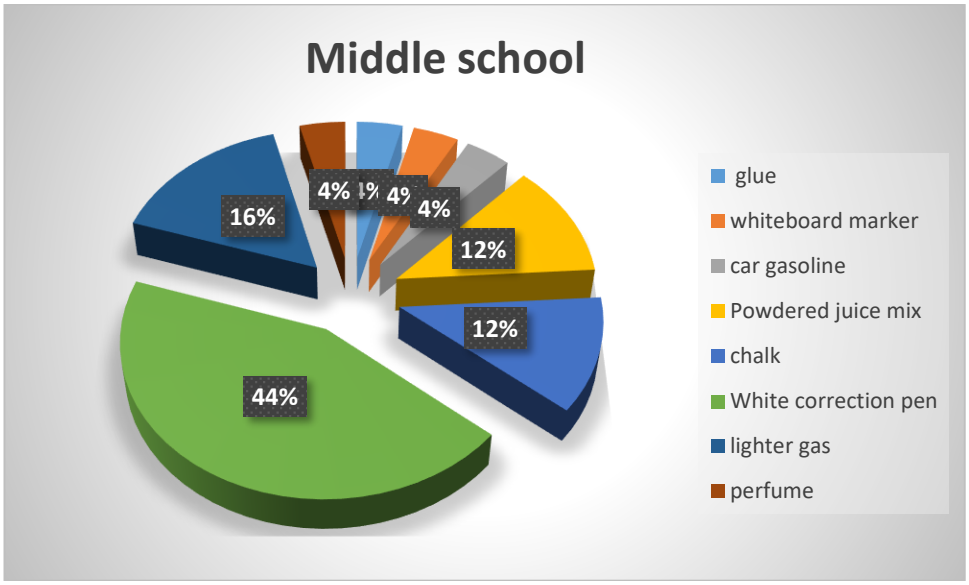
In addition to the questionnaire, semi-structured interviews were conducted with participants when clarification was required. These interviews served as a complementary source of information to explain ambiguous responses, clarify terminology related to the substances used, and obtain a better understanding of the context and patterns of chemical substitute use. The interview data were used to support the interpretation of the questionnaire findings rather than as an independent source of qualitative analysis.

2. Study Results

2.1 Presentation of Results:

After collecting and analyzing the questionnaires, the results presented in the following figure were obtained

Figure (1): Types of Drugs Prevalent in the Middle School Environment

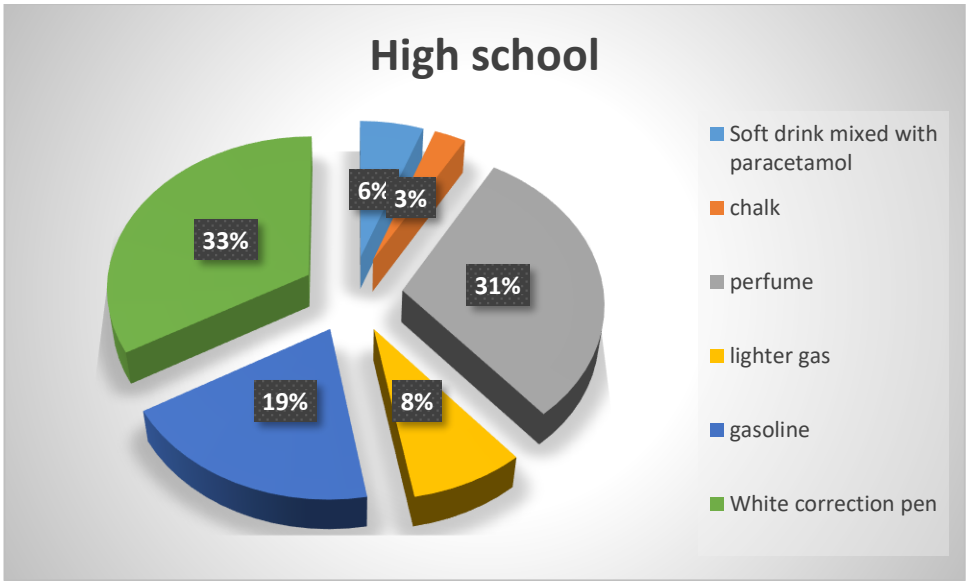


Source : Created by the author based on field study data

Interpretation of Figure(1)

Figure 1 illustrates the distribution of inhalant products used by middle school students as alternatives to conventional psychoactive drugs. The most frequently reported product was the correction pen, accounting for 44% of all reported substances. Lighter gas ranked second (16%), while both chalk and powdered juice mix ("Amila") each represented 12% of the reported substances. The remaining products, including glue, whiteboard markers, car gasoline, and perfume, were reported less frequently, each accounting for approximately 4% of the total.

Figure (2): Types of Drugs Prevalent in the High School Environment



Source : Created by the author based on field study data

Interpretation of Figure(2)

Figure 2 illustrates the distribution of inhalant products and other psychoactive substitutes reported by high school students. The most frequently reported product was the white correction pen, accounting for 33% of all reported substances, followed closely by perfume (31%). Gasoline ranked third (19%), while lighter gas accounted for 8% of the reported substances. Carbonated soft drinks mixed with paracetamol represented 6%, whereas chalk was the least frequently reported substance, accounting for 3% of the total.

2.2 Analysis of Study Results:

1 .Analysis of the First Research Question

What substances are used as alternatives to psychoactive drugs among adolescents**?**

The findings of the present study, as illustrated in Figures 1 and 2 and supported by qualitative interview data, indicate that adolescents in both middle and high school misuse a variety of household and school products as alternatives to conventional psychoactive drugs. The most frequently reported substances included correction pens, glue, gasoline, lighter gas, perfume, whiteboard markers, and other volatile products commonly available in everyday environments. Qualitative interviews further revealed that several participants deliberately inhaled the vapors of correction pen fluid, glue, and similar products to induce psychoactive effects, including euphoria and hallucinations. One participant described the experience as producing "a pleasant and different sensation," providing direct evidence that these products were intentionally used for their psychoactive properties rather than for their intended everyday purposes. Overall, the findings demonstrate that adolescents deliberately misuse legally available volatile products as substitutes for conventional psychoactive substances, highlighting the diversity of products involved in this emerging pattern of substance use

The results of the present study are generally consistent with previous research identifying volatile inhalants as some of the earliest psychoactive substances used during adolescence (Chandrakar et al., 2023; Wu & Ringwalt, 2007). Similar to earlier studies, the substances reported by participants—including glue, gasoline, correction pens, and lighter gas—belong to the category of volatile inhalants that produce rapid but short-lived psychoactive effects following inhalation. However, the present findings also reveal an important context-specific pattern. While previous studies have generally identified glue and gasoline as the most commonly misused inhalants among adolescents, correction pens emerged as the predominant substance among middle school students in the current study. This difference may reflect variations in product availability and patterns of access within Algerian school settings, where correction pens are inexpensive, widely available, and routinely used as educational materials. Consequently, the school environment itself may represent an overlooked source of inhalant exposure that deserves greater consideration in future prevention strategies (Wu & Ringwalt, 2007).

Qualitative interview data provided further insight into the contextual factors underlying adolescents' use of volatile inhalants. Participants consistently reported that products such as correction fluid, glue, gasoline, lighter gas, and perfume were considerably less expensive than illicit drugs and could be purchased easily from stationery shops or local stores without attracting attention. Because these products are legally sold as ordinary school or household supplies, parents rarely suspect that they may be intentionally misused for psychoactive purposes. The school environment itself also appeared to facilitate access, as many of these products are routinely available for educational purposes. These findings suggest that the misuse of inhalants is facilitated by the interaction of economic and environmental factors, particularly their affordability, legal availability, and ease of access. Consistent with previous research, the widespread availability, low cost, legal status, and limited parental awareness collectively create conditions that facilitate early experimentation with inhalants during adolescence (Chandrakar et al., 2023; Wu & Ringwalt, 2007; Nonnemaker et al., 2011; Nakawaki & Crano, 2015).

The present findings can also be interpreted from a neurobiological perspective. The psychoactive effects reported by participants following the inhalation of correction fluids, glue, gasoline, lighter gas, and other volatile products are attributable to the rapid absorption of these highly lipophilic substances through the lungs and their subsequent distribution to the central nervous system. Once they reach the brain, inhalants interact with multiple neurotransmitter systems, including γ-aminobutyric acid (GABA),

glutamate (NMDA), glycine, serotonin, and dopaminergic pathways, disrupting normal neuronal communication and producing transient euphoria, relaxation, and perceptual distortions (Lubman et al., 2008; Beckley & Woodward, 2013). Experimental evidence further demonstrates that volatile solvents such as toluene directly stimulate dopaminergic neurons within the ventral tegmental area, leading to increased dopamine release in the nucleus accumbens, the principal neural substrate of the brain's reward system. This neurochemical response reinforces repeated substance use and represents a fundamental mechanism underlying the transition from experimentation to addiction (Riegel et al., 2007). Furthermore, repeated exposure to inhalants induces neuroadaptive changes affecting brain regions responsible for executive functioning, impulse control, learning, and decision-making. Because the adolescent brain is still undergoing structural and functional maturation, exposure to these substances during this critical developmental period may result in greater neurocognitive vulnerability and an increased risk of developing substance use disorders later in life (Lubman et al., 2008; Cornelio et al., 2025).

The widespread use of inhalants observed in the present study raises important clinical and public health concerns. Although many adolescents perceive these products as harmless because they are inexpensive, legally available, and commonly sold as school or household supplies, scientific evidence indicates that repeated inhalation may produce severe medical and psychiatric consequences. Inhalant misuse has been associated with cardiovascular, pulmonary, hepatic, renal, neurological, and psychiatric disorders, in addition to cognitive impairment and long-term neurodevelopmental alterations. Acute intoxication may result in cardiac arrest, respiratory depression, brain injury, burns, and sudden death, whereas chronic exposure can alter synaptic transmission within the mesolimbic dopamine system and the medial prefrontal cortex, thereby increasing the risk of addiction and persistent cognitive deficits (Radparvar, 2023; Lubman et al., 2008). These findings highlight that inhalants should not be regarded as harmless alternatives to illicit drugs but rather as highly toxic psychoactive substances requiring early detection, preventive education, and multidisciplinary intervention.

An additional finding of the present study was the reported use of unconventional products, such as powdered juice ("Amila") and crushed chalk, particularly among middle school students. Unlike volatile inhalants such as glue, gasoline, and correction fluids, these products are not recognized in the scientific literature as established psychoactive substances. Their reported use may therefore reflect exploratory or imitative behaviors driven by curiosity, misinformation, or peer influence rather than pharmacologically established psychoactive effects. This observation highlights the need for further research to determine whether these practices represent emerging local behavioral trends or misconceptions circulating among adolescents.

Overall, the findings of the present study indicate that adolescents primarily resort to inexpensive, readily available, and legally accessible products as substitutes for psychoactive drugs. Although these substances are commonly perceived as harmless because they are used for educational, domestic, or commercial purposes, the evidence reviewed in this study demonstrates that many belong to the category of volatile inhalants capable of producing acute psychoactive effects and, with repeated exposure, serious neurological, psychological, and medical consequences. The integration of the quantitative findings, qualitative interview data, and previous literature suggests that inhalant misuse among adolescents should be considered an emerging public health issue requiring comprehensive prevention strategies involving schools, families, healthcare professionals, and policymakers.

2 .Analysis of the Second Research Question

Research Question 2: Are there differences in the use of these substances between middle and high school students**?**

The findings presented in Figures 1 and 2 demonstrate clear differences in the pattern of inhalant use between middle and high school students. Although several volatile substances were reported in both educational levels, important variations were observed in both the types of substances used and their prevalence. Correction fluid emerged as the most frequently reported substance among middle school students,

whereas erasable marker pens, perfume, and gasoline were more commonly reported among high school students. Furthermore, certain substances appeared to be specific to one educational level. For example, powdered juice ("Amila") and crushed chalk were reported only among middle school students, whereas gasoline and mixtures of carbonated drinks with headache medication were reported exclusively by high school students. These findings suggest that the pattern of inhalant use changes across adolescence, with differences extending beyond prevalence to include the diversity and nature of the substances used**.**

The age-related differences observed in the present study are consistent with previous research demonstrating that patterns of inhalant use evolve across adolescence. Earlier studies have shown that inhalants are particularly common during early adolescence because younger adolescents tend to experiment with inexpensive and easily accessible products, such as glue and fuel, which are often available in household and school environments (CBHSQ, 2015). The predominance of correction fluid and other school-related products among middle school students in the present study supports this developmental pattern. As adolescents grow older, the range of substances used tends to diversify, reflecting either progression toward more complex patterns of substance use or, in some individuals, discontinuation of inhalant use (CBHSQ, 2015)**.**

The differences observed between middle and high school students may also be interpreted within the framework of adolescent developmental stages. Previous research suggests that middle adolescence (approximately 14–15 years of age) represents a critical period for the initiation and diversification of substance use behaviors (Perron et al., 2009). As adolescents mature, substance use patterns tend to become more heterogeneous, with older adolescents showing greater interest in experimenting with a wider variety of psychoactive substances and engaging in more hazardous forms of use. In the present study, this developmental trend was reflected in the broader range of substances reported by high school students, including gasoline and mixtures of carbonated drinks with headache medication, whereas middle school students more frequently reported simpler and readily available school-related products. These findings support the view that age plays an important role not only in the prevalence of substance use but also in the evolution of the types of substances selected during adolescence (Grechanyĭ et al., 2014)**.**

The observed differences between middle and high school students are likely to reflect developmental changes in adolescents' social environment and behavioral patterns. As adolescents grow older, they generally experience greater autonomy, broader peer networks, and increased opportunities to access a wider range of psychoactive substances. Consequently, the transition from simple school-related products to more hazardous substances observed in the present study may reflect the natural progression of experimentation during adolescence rather than merely chronological age. Similar developmental trends have been reported in previous studies (Perron et al., 2009; Nakawaki & Crano, 2015)**.**

Qualitative interview data also suggested a developmental progression in adolescents' perceptions of these substances. One high school participant explained that the products commonly used by younger students, particularly those available in primary or middle school, were "for children" and no longer produced the desired psychoactive effects. According to this participant, stronger substances were deliberately sought because they were perceived as producing more intense sensations. Although this perception reflects adolescents' subjective experiences rather than objective pharmacological evidence, it may help explain the transition from relatively simple school-related products to more hazardous volatile substances observed among high school students. This finding is consistent with developmental models of substance use, which propose that experimentation during early adolescence may evolve into the search for stronger psychoactive experiences as adolescents grow older (Perron et al., 2009; Nakawaki & Crano, 2015)**.**

Previous research further suggests that substance use often begins during late childhood or early adolescence, typically between 9 and 14 years of age. Early initiation is considered a major risk factor for the subsequent development of substance use disorders because adolescents who begin experimenting at younger ages are more likely to progress from occasional experimentation to more regular and hazardous patterns of use (Nonnemaker et al., 2011). Similarly, Büker (2010) reported that the average age of inhalant use initiation ranged between 14.2 and 14.6 years, with an average duration of use of approximately 3.7 years, emphasizing

that experimentation frequently begins during the school years. These findings provide additional support for the age-related differences observed in the present study. Furthermore, previous studies have demonstrated that developmental differences are reflected not only in the frequency of substance use but also in the types of substances selected. Younger adolescents generally experiment with simpler and more readily available products, whereas older adolescents progressively seek a wider variety of substances perceived as producing stronger psychoactive effects (Nakawaki & Crano, 2015). This developmental pattern is consistent with the present findings, which showed that middle school students primarily reported common school-related products, whereas high school students reported a broader range of substances, including gasoline and mixtures of carbonated drinks with headache medication.

In conclusion, and in response to the second research question, the findings of the present study indicate clear differences in the patterns of inhalant use between middle and high school students. These differences appear to be associated with developmental and age-related factors that influence both substance availability and adolescents' preferences. Middle school students predominantly reported inexpensive and easily accessible school-related products, whereas high school students reported a broader range of volatile substances, including gasoline and mixtures of carbonated drinks with headache medication. Qualitative interview data further suggested that older adolescents tended to perceive these latter substances as producing stronger psychoactive effects, which may explain their preference for products considered more potent than those commonly used by younger students. Overall, the findings suggest that substance use patterns become progressively more diverse and involve substances perceived as more powerful as adolescents grow older, underscoring the importance of age-specific prevention strategies during the school years.

3 .Analysis of the Third Research Question

Research Question 3: What psychological and social factors lead adolescents to engage in such practices ?

The findings of the present study indicate that adolescents' engagement in the misuse of psychoactive substance substitutes cannot be attributed to a single cause. Rather, both the quantitative results and the qualitative interview data suggest that this behavior emerges from the interaction of multiple psychological and social factors. Participants frequently described using these substances to cope with negative emotional states, satisfy curiosity, or seek novel experiences, while others emphasized the influence of peers, limited parental supervision, and easy access to these products. These findings suggest that inhalant misuse among adolescents should not be viewed merely as an isolated act of experimentation but as a complex behavioral phenomenon shaped by the combined influence of individual vulnerabilities and environmental conditions.

The qualitative interview data suggest that one of the primary psychological motivations underlying adolescents' use of psychoactive substance substitutes is the desire to escape negative emotional experiences. Several participants reported using these substances to relieve psychological distress or temporarily distance themselves from personal and everyday problems. Statements such as "It helps me forget my problems" and "It takes me to another world" illustrate that these products were perceived as a means of emotional escape rather than simply as a source of pleasure. This finding is consistent with the self-medication hypothesis, which proposes that individuals may engage in substance use as a maladaptive strategy to regulate unpleasant emotional states, including stress, anxiety, sadness, and psychological distress (Khantzian, 1997). Similar findings have been reported among adolescents using inhalants, where emotional vulnerability and difficulties in coping with stress were identified as important factors contributing to the initiation and maintenance of substance use (Vaibhavi et al., 2024).

In addition to emotional escape, curiosity and the desire to experience novel sensations emerged as important psychological motives underlying adolescents' experimentation with psychoactive substance substitutes. Qualitative interview data indicated that several participants initially used these products simply to discover their effects or because they were encouraged by friends to "try them." For many adolescents, the first experience was not motivated by addiction but by a desire to satisfy curiosity and seek new sensations. This finding is consistent with previous research showing that curiosity represents one of the most common reasons for initiating substance use during early adolescence, particularly when

psychoactive products are inexpensive, easily accessible, and perceived as relatively harmless (Perron et al., 2009; Chandrakar et al., 2023). From a psychological perspective, this pattern is also compatible with sensation-seeking theory, which suggests that adolescents are naturally inclined to pursue novel, exciting, and emotionally stimulating experiences because of ongoing developmental changes in reward sensitivity and behavioral regulation (Zuckerman, 2007).

Social influences also emerged as a major factor contributing to adolescents' engagement in these practices. Qualitative interview data revealed that peer influence frequently acted as the initial trigger for experimentation. Several participants reported that they first tried these substances because a friend encouraged them to do so, while others explained that they experimented simply because "everyone in my class was doing it." These statements suggest that substance use was often perceived as a socially accepted behavior within certain peer groups, where conformity and the desire for group acceptance outweighed concerns about potential health risks. This finding is consistent with previous research demonstrating that peer norms and perceived peer approval are among the strongest predictors of inhalant use during adolescence (Nakawaki & Crano, 2015). From the perspective of Social Learning Theory, adolescents acquire and maintain such behaviors through observation, imitation, and social reinforcement, particularly when substance use is modeled or encouraged by close friends (Bandura, 1977).

Family-related factors also appeared to play an important role in adolescents' engagement in inhalant use. The findings of the present study indicated that limited parental supervision, emotional neglect, and family disintegration were among the most frequently reported social factors associated with these behaviors. Adolescents who experience weak family support or spend extended periods without effective adult supervision may be more likely to experiment with readily available psychoactive substances. In such contexts, the absence of parental monitoring reduces opportunities for early detection and intervention, while limited emotional communication may increase adolescents' vulnerability to seeking alternative sources of relief or social belonging. These findings are consistent with previous research demonstrating that low parental monitoring, poor family cohesion, and reduced parent–adolescent communication are significant predictors of inhalant and other substance use during adolescence (Nakawaki & Crano, 2015; Nonnemaker et al., 2011).

An additional finding emerging from the qualitative interviews was the widespread underestimation of the health risks associated with inhalant use. Several participants believed that products such as correction fluids, glue, and lighter gas were considerably less harmful than conventional illicit drugs, with one adolescent explicitly stating that these substances were "not as dangerous as cocaine." Such perceptions may reduce adolescents' perceived susceptibility to harm and increase their willingness to experiment with legally available psychoactive substances. This finding is consistent with the Health Belief Model, which proposes that individuals are more likely to engage in risky behaviors when they perceive the associated health risks to be minimal or believe that the potential consequences are unlikely to affect them (Rosenstock, 1974; Champion & Skinner, 2008). Similar misconceptions regarding the safety of inhalants have also been reported in previous studies, where adolescents frequently considered these products less harmful because they are legally available and commonly used for domestic or educational purposes rather than being classified as illicit drugs (Chandrakar et al., 2023).

In conclusion, the findings of the present study indicate that adolescents' engagement in the misuse of psychoactive substance substitutes is the result of a complex interaction between psychological, social, and cognitive factors rather than a single isolated cause. Qualitative interviews revealed that emotional distress, curiosity, peer influence, limited parental supervision, and misconceptions regarding the safety of inhalants collectively contribute to the initiation and maintenance of these behaviors. These findings emphasize that effective prevention strategies should extend beyond restricting access to volatile substances and should also address adolescents' mental health needs, strengthen family and school support systems, improve parental supervision, and correct misconceptions regarding the health risks

associated with inhalant use. Such multidimensional interventions may be more effective in preventing the early initiation and progression of inhalant misuse during adolescence.

Conclusion:

The present study provides further evidence that the misuse of psychoactive substance substitutes among adolescents constitutes an emerging public health concern characterized by the use of inexpensive, legally available, and easily accessible inhalant products. The findings demonstrated that volatile substances such as correction fluids, glue, gasoline, lighter gas, and other household or school products were the most frequently reported alternatives to conventional psychoactive drugs. Moreover, clear differences were observed between middle and high school students, suggesting that patterns of substance use become increasingly diverse and involve products perceived as more potent as adolescents grow older.

The study further demonstrated that adolescents' engagement in these practices cannot be explained by a single determinant but rather results from the interaction of psychological, social, and cognitive factors. Emotional distress, curiosity, peer influence, inadequate parental supervision, and misconceptions regarding the safety of inhalants collectively contributed to the initiation and maintenance of substance use. These findings highlight the importance of interpreting adolescent inhalant misuse within a multidimensional framework that integrates individual vulnerability with environmental and social influences.

From a practical perspective, the findings emphasize the need for comprehensive prevention strategies that extend beyond restricting access to volatile substances. Effective interventions should incorporate school-based prevention programs, family education, psychological support services, and public awareness campaigns aimed at correcting misconceptions regarding the safety of inhalants and strengthening adolescents' coping and decision-making skills. Future research should also investigate the long-term developmental consequences of inhalant misuse and evaluate the effectiveness of targeted prevention and early intervention programs across different adolescent populations.

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