

The Influences Factors of Adolescent Substance Use and Prevention

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Abstract. Adolescents' substance use is a global burden to solve. The emotional and social brains are sensitive to seeking risky behaviors and the cognitive control is not strong enough to restrain it. Adolescents start to use various kinds, and it might last for their entire life. Also, the negative impact of adolescent substance use is consequential, and it will impact various aspects of adolescents' academics, life, and family. This study aims to explore the family influence on adolescents and the co-morbidity of adolescent substance use. Firstly, understanding the neurobiological brain function alternation of substance use. Secondly, the family can serve as a risk factor and protective factor. Family-based prevention as an effective method to prevent adolescent relapse is discussed.

Keywords: Adolescent substance use, Family history, Family-based prevention, Neuroimaging.

1. Introduction

Adolescent substance abuse is a debated problem, and it is America's leading public health concern. Adolescence is one critical period when most people start abusing substances. For example, Gray & Squeglia state that lifetime endorsed alcohol use (64%), marijuana (45%), and cigarette use (31%) by the age of 18 [1].

The substance has an addictive characteristic, some adolescents shift from initial use to substance use disorders. The data in Gray & Squeglia show that 15 percent of adolescents meet alcohol abuse clinic criteria and 16 percent meet clinical criteria for drug abuse by the age of 18 [1]. It is noteworthy that cigarette use has decreased sharply over the last several decades, while the prevalence of e-cigarettes has grown in popularity. For example, 13 percent of teenagers report that they used e-cigarettes in the preceding month. On the contrary, cigarette usage is 3 percent [1].

2. The neurobiological consequences and model

2.1 Dual system model

Dual systems include two brain structures, the first one is the stratum (responsible for reward sensitivity), and the second one is cognitive control. Adolescents demonstrate more risk-seeking behaviors compared to children and adults. The excitation of an early-maturing emotional and social processing system means that adolescents are more attracted to exciting, pleasant, and new activities. Furthermore, the cognitive control system is still premature and is not powerful enough to consistently constrain possible dangerous impulses [2]. Adolescent substance use risk was most strongly linked to discrepancies in striatal activation and, more specifically, motivational context [3]. When accessing cues signaling loss, the striatum is hyperactive, and the amygdala is excited when trying to evaluate elevated-risk possibilities [4]. According to the dual risk model, an overactive reward system is strongly linked to risky substances in adolescents [3].

2.2 The longitudinal study of brain structure and adolescent substance use

Cognitive control, in addition to the premature status of social and emotional brain development, means that adolescents have higher chances to involve in risky behaviors [5]. While the insular cortex

is well-known for its role in risk interpretation, it also serves as a crucial part in converting interoceptive cues into conscious emotional responses and biases during risk or reward judgment [5]. Brain coupling was identified to be significant in adolescents with poor cognitive control [5]. Brain coupling implies that brain abnormalities were associated with more chances involving risky behaviors that may be a contributor to substance use disorders in later stages of life and that longer time of substance use and frequency during adolescence lead to this kind of brain abnormalities judgment [5]. The neurobiological study show, that adolescent with a deficiency in cognitive control have insula responsiveness to risk-seeking behavior resulting in postulated health issues [5]. Evidence from Tervo-Clemmens et al. suggests that substance use weakness may be categorized by a particular sensitivity to the behavior of compulsive and goal-untargeted compared with the simple reward drive increase [3]. Tervo-Clemmens et al. also suggest further research is needed to investigate the innate reward functions of risky adolescent substance use behavior [3].

Kim-Spoon et al. et al. discovered that increased adolescent substance use was associated with elevated levels of insular excitation during risk-seeking behaviors [5]. The first clue is that repeated drug exposure may increase reward availability and elevate insular activation. The second is that adolescents who have insufficient cognitive control might be especially vulnerable to intensified stimulation and their insulas will respond to conscious urges, negative mood, and other somatic sensory cues due to compromising cognitive control [5]. For example, in adolescents with a deficiency of cognitive control, self-reported data shows that reward sensitivity and punishment sensitivity are associated with negative consequences of substance use judgment [5].

2.3 Parental warmth and adolescent emotional brain function

Parenting behavior and attitude represent one of the most significant effects on the growth of children and adolescents [6]. Parenting style is especially important during early adolescence when adolescents experience major emotional, perceptual, and changes in society, as well as enhancement in substance use as well as some types of psychopathologies [6]. Responsive parenting throughout early adolescence may protect children from psychological disorders [6]. In comparison, dysfunctional parenting, such as declined warmth, enhanced negative parenting) throughout early adolescence, forecasts increase in substance use in the long term and internalizing psychological disorders and externalizing disorders into mid-adolescence [6].

Stronger noticed maternal emotional state in a parent-adolescent (11-17 years old) engagement was associated with declined emotional brain stimulation to a peer refusal task in adolescents. The involved social and emotional brain structures are the anterior nucleus accumbens, insula, amygdala, and subgenual ACC (anterior cingulate cortex) [6]. Chaplin et al. found that a study investigating late adolescents discovered that in a peer rejection task, greater self-reported maternal authoritarian (strict, punishment) parenting style was linked to the reduced caudate response. It is also linked to adolescents' declined emotional brain activation- VLPFC (Ventrolateral PFC) with inhibited behavior [6]. Third, in a study focused on children and adolescents (9-16 years old) researchers discovered that elevated children's perceived parental overcontrol was linked to a decreased insular reaction to emotional conflict activity [6]. Fourth, Romund and colleagues discovered that in adolescents (13-16 years old), adolescents- reported reduced maternal support/warmth was associated with higher amygdala response, which reacts to negative emotions on faces [6]. Moreover, maternal support/(warmth) has also been linked to adolescent neural activity and reward processing, according to research [6]. To summarize, preliminary research suggests that parenting actions are linked to changed adolescent emotional brain function. More research, especially on connections with adolescent adjustment, is considered necessary [6].

2.4 The neurobiological consequences

The healthy development of the brain is important to adolescents because even slight adjustments in biological developmental pathways impact a variety of perceptual, emotional, and psychosocial

functions. Adolescent brain development altered by neurotoxins, particularly alcohol and other substance, may set the scene for perceptual issues when they became adults with clinical features across the whole of life [1].

3. Comorbid

3.1 The prevalence of comorbid

Even low levels of substance use, and substance use issues were significantly linked to an elevated likelihood of many psychological disorders, including internalizing and externalizing difficulties. Internalizing difficulties include depression, anxiety, and so on [7]. Externalizing difficulties include ADHD (Attention-deficit-hyperactivity disorders), conduct disorders, and so on [7]. Moreover, adolescents with co-morbid substance use and psychological problems reported more severe mental health symptoms than adolescents without co-current substance use [7].

3.2 Anxiety

Any anxiety disorder has a lifetime prevalence of 38 percent in women and 27 percent lifelong occurrence in men. Individuals with a history of substance dependence were approximately 2.9 times higher to experience illegal substance use and co-morbid with any anxiety disorder. Men with anxiety disorders have an elevated risk compared with women with these disorders to have a comorbid substance use disorder, despite the prevalence of anxiety disorders occurring more in women [8].

3.3 Depression

Previous studies have demonstrated strong connections between depression and substance use disorder. The ratio varies from 1.3 to 2.6. According to epidemiologic studies, adolescents with SUDs are more likely to have MDD compared with those without. Adolescents with depression have increased tendencies than those without to develop a substance use disorder. In 2017, adolescents who experienced illicit drugs in the previous year were greater among those who had a recent major depressive episode than among those who had not. The percentage is 29.3 percent versus 14.3 percent [8].

4. Family history as a potential trigger

4.1 Neurobiological foundations

Living in a risk-taking family setting may raise the likelihood of attempting to make risky decisions [4]. The neuroimaging evidence shows that adolescents who have greater family multi-risk situations such as family risk-seeking behaviors experienced increased amygdala stimulation when choosing higher-risk behaviors to receive potential rewards [4]. The amygdalas role is to assess the value of the environment's stimuli and to start engaging in alerting and attention capabilities [4]. Adolescents growing up in uncertain and harsh family environments may react to surrounding demands in response to adversity cues via vigilance and attention [4].

4.2 Model effect of parents

Parents who use substances converse with their adolescent's acquiescence to substance use. A modeling effect will appear if adolescents observe their parents' substance consumption. Substance use by parents could also enhance the availability of that specific substance [9].

4.2.1 Drinking history

Parental alcohol use is linked to initial adolescent alcohol consumption and persists through early adolescence to late adolescence. Furthermore, the alcohol use of parents has been discovered as an

indicator of both the early adolescence of parents and the adolescent's friend choices [10]. Initiation of drinking is linked to aggressive behavior, gender, and the educational background of the father. Perceived parental endorsement and existing parental drinking situation both projected the initiation of sipping behavior or tasting, impacting perceptions toward these actions. A family history of alcoholism has also been linked to the initiation of drinking. Also, its association is more powerful before 15 years old of adolescents [9].

4.2.2 Marijuana history

Parental marijuana use has been linked to adolescent marijuana initiate use. This association is influenced by parental attitudes toward the usage of marijuana. This means that decreased parental supervision and increased exposure to marijuana makes adolescent more vulnerable to use [9].

4.3 Parental abuse

Recent research focuses on the role of childhood adversity when considering adolescent substance use problems. Although non-relatives can be abuse abusers, birth parents are the majority of abusers, and the abuse field is very nuanced [11]. Parental abuse has a mixed impact on adolescent substance use. Hussey et al. reported that the connection between external maltreatment and alcohol consumption was relatively weak, while sexual violence and marijuana consumption was highly connected [11]. In another study, Benedini & Fagan illustrates that in girls, internalizing issues and anger influenced the link between external maltreatment and substance use. While in boys, there is only anger [11].

5. Parental relationship as a protective factor

Parental engagement and patterns have gotten a lot of attention in the investigation [11]. Parents are important and powerful sources of information in adolescents' social circles, significantly affecting not only adolescent substance use frequency but also friendship tie options [12]. Rusby et al. indicate that parental control and parental-youth quality during the transitional stage (from children to adolescent and from adolescent early stage and late stage) are of significant practical importance [10]. There are two methods to investigate parenting behaviors' influence on adolescent substance use situation. The first one is broad parental responsiveness (parental warmth) and the second one is parental responsiveness (parental warmth). Parental warmth refers to actions focused on adolescents that convey a signal of love, such as praise and active participation, whereas parental supervision refers to actions aimed at shaping adolescent behavioral patterns, such as guidance and discipline [11].

5.1 Parental warmth

Parental warmth is expressed in the following aspects. The perceived adolescent-parents relationship quality [10], the number of time adolescents spent with parents [13], and the openness of the adolescent-parents relationship [10]. Secondly, the amount of time spent with parents is frequently linked to positive developmental benefits, both for the quality of the connection and for the growth of the adolescent. An increased number of hours spent with parents normally protects an adolescent from potentially hazardous situations, such as substance use [13].

Secondly, Parents who have been supportive of their adolescents, efficaciously track and supervise their actions and affiliates [14]. Adolescents have less chance to participate in the use of the substance and other delinquent events, or they will delay the initiation time of use [14]. When viewed in this light, parents act as a promotional or direct resilience role in adolescent substance use [14]. Thirdly, open conversations between parents and adolescents belong to parental warmth [12]. They were linked to a reduced increase trend in substance use during the early period of adolescence. Evidence from these studies suggests that parent involvement tends to act as a dynamic process of parent engagement [12]. The communication involves rules containing messages from parents, such as

parental expectancies. It is essential to establish a high-quality relationship between parent and adolescent [12].

5.2 Parental control

Supervision and awareness could be the most broadly recognized methods to protect adolescent substance use in the field of parental control [11]. The definition of parental monitoring might vary in different studies, but it is all related to adolescent substance use behavioral patterns. For instance, parental monitoring, which includes parental supervision and rule establishment, can serve as a protective factor to decrease the probability of adolescent substance use. Also, when parental monitoring, described as child information disclosure to parents, has been shown to reduce risk behavior patterns [15]. The starting time of substance use is also related to parental monitoring. Evidence from Rusby et al. discovered that on average, the reported adolescent awareness of parental supervision reduced the initial use of alcohol and marijuana by roughly one-third [10]. Correspondingly, the lower function of parental interaction and supervising which belongs to parental demands were both linked to increased alcohol and marijuana being used in 8th grade [12]. Besides, parental monitoring insight and high-quality parent-adolescent relationships can function as buffers against the adverse repercussions of adolescent substance use [15].

5.3 Parental Knowledge

Without parents' knowledge, adolescents who used substances at home did drink more frequently and heavily compare with adolescents who did not use substances [16]. To be more specific, they expressed more drinking behaviors and use marijuana more frequently [16]. However, they also reported less parental participation and supervision [16]. Furthermore, they endorsed increased marijuana consumption and drinking. It implies that family involvement, instead of parental knowledge itself, maybe a protective factor in dealing with adolescent substance use problems [16]. Voluntary adolescent disclosure, caregiver-initiated solicitation, and parental supervision all have an impact on parental knowledge. Methods like communication, an authoritarian style of parenting, and the formation of straightforward substance regulations have all been shown to boost parental knowledge [16].

6. Adolescent Treatment

6.1 The difference between adolescent treatment and adult treatment.

There are three main characteristics needed to be addressed when considering treatment to prevent adolescent substance use. The first one is the difference between the most frequent abuse of substances and substance use patterns. In 2011, for example, more adolescents in the age period 12-17 experienced marijuana treatment than alcohol treatment [17]. The percentage is 65.5 percent for marijuana treatment and correspondingly 42.9 percent for alcohol prevention [17]. This means that the prevalence of marijuana abuse is greater than alcohol [17]. However, the situation for an adult is reversed. Adult aged above 26 shows 66.5 percent of alcohol abuse and 17.1 marijuana abuse [17]. The behavior pattern is also different. When adolescents do consume alcohol, they tend to behave more binge drink compared with adults (the definition of binge drinking behavior is five or more drinks at one time [17]). The second one is less serious withdrawn symptoms and more hiding problems. The reported withdrawal symptoms are less when compared with adults when quitting a substance. This means that when they quit substances, they are less likely to experience physical or psychological issues [17]. However, the hiding problems appear more frequently than in adults and they might conceal their behavior of consuming substances [17]. The related consequence is that they tend less likely to seek help and it will bring them serious problems. The third one is the potential lack of knowledge about themselves and their substance [17]. Adolescents may not recognize their behaviors and related issues [17]. That means they are uncertain about the consequence of substance abuse. In this situation, they might not realize their need to be assisted to do interference [17].

6.2 The family-based prevention

Based on Bronfenbrenner's combination of social environmental and human development theories, eco-developmental systems assume that children's growth is shaped by many interconnected systems throughout time [18]. Because of the basic role that families engage throughout child and adolescent development, it takes priority and centralizes the child and adolescents in the family's developmental ecology [18]. One method for preventing adolescent substance use is the family-based approach, which is more effective than many other protective methods. These programs include a variety of therapies, including behavioral therapy, CBT (cognitive behavioral therapy), and other regular practices. The statistical data shows a decrease from ten days of use in the previous month to six days of use, a nearly 40% decrease rate of substance use [18]. Horigian et al. also mentioned the weakness of this meta-analysis. There are three limitations. Firstly, this intervention did not, It, for example, make comparisons of family therapeutic interventions to all forms of therapy [18]. Secondly, it did not differentiate between the influence of family counseling and particular nonfamily-focused interventions [18]. Thirdly, this intervention did not address long-term post-treatment influence [18].

7. Conclusion

The association of family impact to adolescent substances has been discovered in many studies in this kind of field. However, the content of family impact is ambiguous. There are few studies to investigate the adolescent brain of family influence on their substance use situations. Firstly, it includes the family history as a potential risk for adolescent substance initiation use. Secondly, it includes parental warmth and demands as possible methods to prevent adolescent substance use. Finally, family-based prevention is also discussed in this paper to decrease substance use frequency and degree. Future research can focus more on the neuroimaging of the adolescent brain when they undergo parental abuse and the link between parental control to adolescent substance use.

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