Review Article

Social, Neuroscientific and Psychological Factors that Contribute to Alcohol Use Among Teenagers

Hayley Liu

Del Norte High School, 16601 Nighthawk Lane, San Diego, CA, 92127, United States

ABSTRACT

Adolescent alcohol consumption has detrimental effects on teenage physical and mental health, potentially leading to behavior problems. The habits and attitudes of individuals in school or at home, including friends or family, can influence teenage perceptions toward drinking. Specifically, teenagers may experience peer pressure from their friends to drink alcohol, which can initiate a cycle where drinking leads to increased alcohol intake and potentially alcohol use disorder, or addiction. Furthermore, factors like social media and marketing may convince teenagers to consume large amounts of alcohol as well. Additionally, certain brain regions are implicated in the development of alcohol use disorder, including the limbic (i.e., reward) system and the prefrontal cortex, among others. Lastly, alcohol can negatively affect teenagers' executive function and increase impulsivity. This paper will discuss the factors that lead to teenage alcohol use, the neuroscience behind it, and the psychological components.

Keywords: adolescent alcohol use, teenage alcohol use, alcohol use disorder, addiction, peer pressure, brain development, impulsivity

INTRODUCTION

Alcohol use among adolescents is an increasingly alarming problem in the United States. In fact, it has been estimated that 12% of 8th graders, 22% of 10th-graders, and 29% of 12th-graders reported that they have engaged in heavy episodic drinking (1). Further, alcohol is the most commonly used substance among adolescents, often in large quantities (2), and it has been shown that heavy alcohol use often continues to escalate into young adulthood (3). Underage drinking is also extremely harmful as it can lead to many repercussions in different aspects of life including health, social relationships, and academic performance. Physical health, mental health, and brain development can be negatively affected as youth are not fully developed yet. For example, the immune system can become more prone to damage, depression and thoughts of suicide may increase, and areas in the brain related to decision-making and learning can be impaired. Further, declining health can result in various social consequences, including decreased academic motivation and performance and damaged friendships and family relationships. Additionally, the CDC stated that underage drinking results in more than 4,300 deaths annually (4), ultimately illustrating that youth alcohol addiction leads to severe consequences that need to be recognized. This paper attempts to examine and explain major factors that contribute to adolescent alcohol use as well as its

Corresponding author: Hayley Liu, E-mail: hayleyliusd@gmail.com.

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consequences, specifically through a multidimensional lens that includes social, neuroscientific, and psychological elements.

SOCIAL FACTORS RELATED TO TEENAGE ALCOHOL USE

When teenagers start drinking, they may be influenced by the habits and attitudes toward drinking by those around them. Many adolescents desire to fit in with their peers and fear social exclusion so they may experience peer pressure from others to drink alcohol, often feeling obliged to drink (5). In addition, teenagers may also be drawn to drinking because of curiosity or experimentation (6), which leads them to emulate the behavior of their peers and perceive the behavior as acceptable or appealing, normalizing drinking within their social circles. They may be convinced to drink alcohol because of social media and marketing as well. According to CASAColumbia's teen surveys, "75% of 12-to-17-year-olds said that seeing pictures of teens partying with alcohol or marijuana on Facebook, MySpace or another social networking site encouraged other teens to want to party like that" (7). While this suggests that teens perceive a social influence from what they see online, the survey reflects self-reported perception and does not establish a causal link. Social media frequently promotes drinking as a common enjoyable activity and advertisements are present almost everywhere. The idea that drinking is essential to having fun is reinforced by the regular posting of pictures and videos of celebrities and influencers enjoying beverages at events and parties (8). In order to fit in or be accepted by others, young people may feel pressured to adopt these habits as they become normalized through repeated exposure, though this reflects an association rather than confirmed causation.

The social factors of youth alcohol addiction include in-person experiences as well as online aspects. Teens may come across situations at parties or hangouts where alcohol is present, and most people are drinking. It can be direct in situations where others are telling or encouraging an individual to drink and the individual has to make an immediate decision (9). Conversely, indirect situations are caused by environmental factors and internal pressure from the sights of others drinking (10, 9). For example, at a high school party, a teenager might be offered a drink by a peer, and perhaps encouraged to drink, an example of direct pressure. On the other hand, a teenager might feel pressured to drink when observing that everyone else is holding a red cup filled with alcohol, even if they don't particularly want to, an example of indirect social pressure. These two types of situations are supported by Social Learning Theory (11), which explains how individuals learn by observing and imitating others' behavior. This can be extended to describe how youth might begin to use substances, such that youth eventually adopt substance using behaviors through direct observation of others (12). This environment makes it difficult for youths to refuse, especially when they see drinking as a way to bond with peers or gain popularity. Additionally, the circumstances have been associated with increased peer pressure and conformity, though causal mechanisms remain complex and multifactorial (13). Peer pressure is one key component that can lead teens to conform with others. The desire for conformity is an important contributor to alcohol use since it causes teenagers to align their behavior and attitudes with other groups or trends. Youth adapt their beliefs to the social norms and desire to fit in with others. Moreover, conformity is greatly affected by an individual's level of self-efficacy as a lower level of self-efficacy has been correlated with a stronger urge to conform and a higher chance of binge drinking (10). Finally, social sensitivity (14) causes teens to be particularly susceptible to peer influence. Teens who are shy or feel excluded, for instance, could view drinking as a means of reducing society anxiety and fitting in with their peer group. Alcohol use has also been found to be consistently associated with experiences of social anxiety (15). In some cases, it has been found that drinking and social anxiety are positively related, such that as teens experience anxiety, they drink more (16). However, this reflects a correlational relationship, and it is unclear whether anxiety directly causes increased drinking, or vice versa. The converse has also been found to be true, such that some teens, out of fear of being criticized for drunken behavior, tend to drink less or avoid drinking as anxiety increases (15). In any case, teens may not consider the long-term effects of drinking, such as health hazards or declining academics, since their brains are programmed to emphasize social pleasures, fit in with the group, and reduce feelings of tension.

Teens are not only exposed to peer pressure in person but also through online interactions. Social media has greatly advanced, and the amount of use has significantly increased in the past years with teens constantly interacting and sharing information. Teens frequently see friends posting pictures from parties where alcohol is consumed. This constant exposure may normalize drinking among youth and create the idea that teenage drinking is commonplace (12) and engagement

with this type of media among youth has been linked to increases in drinking behavior (17; 18). However, these studies demonstrate correlation rather than causation, and other factors—such as preexisting attitudes—may also influence drinking behavior. Further, this exposure can also create a fear of missing out or FOMO (19) and create the feeling of urgency to engage in similar behaviors. This is especially problematic as it has been shown that the majority of social media posts containing alcohol portray positive experiences, whereas negative experiences are rarely, if ever, portrayed in these videos (20). Further, it has been shown that these videos garner more likes and comments than videos that do not contain such content (20). In addition, hashtags, captions, comments, and links can spread posts that include drinking. For example, someone may post a picture from a party featuring alcohol and caption it "Sam was super drunk hahaha". Their friends may then comment on the post which gives viewers the idea that getting drunk is a pleasurable activity. Further, adolescents can spread alcohol related websites or post party invites on social media to influence others to take part in their drinking activities (12). Moreover, the Media Practice model (21) emphasizes that social media users watch and interact with posts that relate to their preferred or perceived identity. This is important because if a teen wants to explore alcohol and start drinking, social media will likely further influence them to do so, increasing the likelihood of that teen's alcohol use. Additionally, influencers or celebrities that teens follow might casually feature alcohol consumption during live streams or in their posts, attracting teenagers and leading them to believe that the activity is normal and exciting (8). Further, social media apps create uniquely-designed algorithms to present to users, based on their search history and engagement with certain social media content (22). Therefore, it is likely that as a result of increased media exposure, teens not only learn that drinking is common, but also pleasurable, and may seek out further related content. This is then reinforced by the apps' algorithms to present users with even more alcohol-related content.

Marketing also plays an important role in youth alcohol use. If a teenager is scrolling on a social media platform and they come across a viral or trending advertisement about alcohol, their curiosity and the social media algorithm could lead them to watch more videos showcasing alcohol which may eventually convince them to try alcohol. In fact, research has shown that on social media platforms, youth may be directly targeted with alcohol-related advertisements (23, 12). Moreover, many television shows consist of alcohol drinking such as Love Island or the NFL. Love Island is a trending television show and especially popular around youth. However, the contestants' alcohol intake on the show could possibly attract the teenage viewers to do the same. Additionally, NFL broadcasts commonly display beer advertisements and sponsors which are widely seen by young people.

NEUROSCIENTIFIC FACTORS RELATED TO TEENAGE ALCOHOL USE

With regard to biological factors that contribute to problematic alcohol use and alcohol use disorders, the limbic system in the brain is theorized to play a central role. Most of the neurobiological changes described here have been primarily observed in adult populations, and while similar mechanisms are believed to occur in adolescents, ongoing research is investigating how these changes specifically manifest during adolescent brain development. Emotions, motivation, and pleasure are governed by the limbic system, also known as the brain's reward system. Drinking alcohol causes the limbic system to release more dopamine, a neurotransmitter linked to emotions of reward and pleasure (24). Repeated alcohol consumption over time can change the reward systems in the brain, increasing a person's dependence on alcohol for pleasure and fostering compulsive drinking habits (25). Cravings and a decreased capacity to enjoy other activities can result from these changes. The prefrontal cortex, located at the front of the brain, is essential for impulse control, behavior regulation, and decision-making (26). Alcohol interferes with this region's normal functioning by affecting judgment, self-control, and the capacity to weigh risks and consequences (27). Chronic alcohol consumption can harm the prefrontal cortex over time (26), making it harder for a person to control their drinking even when there are negative effects. Individuals find it more difficult to quit drinking even when they are aware of its negative effects because of this reduced control, which is a defining feature of addiction. By promoting drinking habits and compromising the person's capacity to resist urges and make logical decisions, these brain alterations contribute to alcohol use disorders.

Brain alterations that occur in specific regions are believed to progress over time and are directly related to continued alcohol use. It has been well-documented that a large part of how and why alcohol addiction takes place is due to alcohol-induced changes in the brain's reward system (28) which affects many parts of the brain including the basal ganglia, prefrontal cortex,

and extended amygdala. Most often, alcohol stimulates the reward system starting in the basal ganglia where the binge/intoxication stage begins and reward circuits and incentive salience circuits are activated (29). These circuits lead to feelings of pleasure, further increasing the incentive salience, or reinforcing quality, of alcohol. Associated neurotransmitters at this stage are linked to reward, such as dopamine, GABA, and glutamate (30). Alcohol users learn which activities, people, places, or things are linked to alcohol use and learn to seek them out, in anticipation of receiving the reward of alcohol. As addiction continues, it is often the case that motivators for drinking shift from the rewarding qualities of alcohol to negatively reinforcing qualities, such as the reduction of anxiety or stress. In the extended amygdala, withdrawal occurs and stopping alcohol intake leads to a decreased activity in the reward circuits but an increased activity in the stress circuits (29). Alcohol users next learn that alcohol is necessary to relieve uncomfortable emotional states; in other words, as anxiety and discomfort increase, alcohol is "needed" in order to feel normal instead of for pleasure. Reward and anti-stress neurotransmitters are lost while stress neurotransmitters activate, resulting in a great amount of dysphoria. Lastly, preoccupation/anticipation occurs in the prefrontal cortex where neurotransmitters such as glutamate and ghrelin are released. In this step, alcohol intake can impair the executive function of the brain which controls judgement and impulse, and alcohol is intentionally sought out and drinking continues to increase, often at great costs (31, 32). This leads to high impulsivity and unwise decision making which increases the likelihood of continued alcohol use (33). Individuals' ability to logically plan and think through consequences of drinking is decreased and individuals continue to learn to prioritize alcohol despite consequences (34).

PSYCHOLOGICAL FACTORS RELATED TO TEENAGE ALCOHOL USE

There are many psychological factors that also contribute to alcohol use and misuse. For example, alcohol intake can negatively impact on the executive function which controls decision-making and impulsivity. One key aspect of executive function affected by alcohol is working memory—the ability to hold and manipulate information in the mind. Executive function impairment can result in declining working memory (35) response inhibition, and REM sleep. According to a study, poor working memory was highly associated with drinking more alcohol (36). The researchers observed that the individuals with high doses of alcohol had weaker working memory. A good working memory in adolescents is extremely important because it allows them to hold information in their minds which is key for achieving success in academics and general decision-making. Drinking alcohol disrupts the areas of the brain in charge of short-term memory (37), which causes more difficulty for tasks and weakens working memory. When working memory declines, response inhibition also tends to decline (36) as the difficulty to prevent an inappropriate response increase. Since it is more challenging to keep critical information in your mind, there is a higher chance of impulsive or bad decisions.

In addition to cognitive effects, alcohol use also negatively impacts sleep quantity and quality. In fact, there are high levels of comorbidity between insomnia and alcohol use disorder (38). The negative impacts of alcohol use on sleep, however, are largely dependent on acute alcohol consumption versus more chronic use and are associated with different consequences. Initially, alcohol has sedating effects, meaning that drinking helps one fall asleep quickly; however, as time passes, alcohol causes more light sleep and the possibility of waking up more frequently. One associated consequence is less rapid eye movement (REM) sleep, which is one state of sleep where the individual has rapid eye movement and is the deepest sleep (39). With regard to chronic alcohol use, these effects become more sustained and ongoing. Overall, less sleep quantity and decreased sleep quality can negatively affect daily functioning, attention, and decision-making, which ultimately negatively affects a teenager's daily life.

Together, impairments in working memory, response inhibition, and sleep caused by alcohol use can significantly undermine adolescents' cognitive control and self-regulation, contributing to impulsive behaviors and increasing the risk of continued or escalated alcohol consumption.

CONCLUSION

As this paper has shown, teenage alcohol has been a growing issue in society. It is caused by various factors in the social, neuroscientific, and psychological perspectives. In the social aspect, components such as peer pressure, social media exposure, and marketing strategies reinforce teenagers' desires for alcohol. In the neuroscientific aspect, the reward system and the limbic system are important parts that make it difficult to resist or stop alcohol intake. In the psychological aspect, working memory, response inhibition, and sleep quality are all factors that

if weakened, can further weaken the executive function, putting alcohol use more at risk. Teenage alcohol use is high risk and a topic that should be addressed in school and at workplaces more frequently. Schools should offer an alcohol education focused on resisting peer pressure and managing social anxiety. Parents need accessible resources to support healthy choices, and stricter rules on youth-targeted alcohol advertising, especially on social media, are necessary. Early screening and counseling can also help identify and assist at-risk teens before problems escalate. These steps should be taken in order to reduce the negative consequences that can result from drinking.

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