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Impact of Alcohol on the Cognition of Individuals Special Emphasis on The Age Group of 15-25

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Abstract: Adolescence and early adulthood (ages 15-25) are key times in brain development, with notable changes in cognition, emotional control, and executive functioning. Alcohol intake during this critical developmental window has been demonstrated to impair neurocognitive maturation, although the degree and particular nature of these effects are still being investigated. This study looks at the cognitive and psychological repercussions of alcohol consumption in teenagers, focusing on executive function, attention, memory, and emotional regulation. The Stroop Colour and Word Test (SCWT) and the Wisconsin Card Sorting Test (WCST), two standardised cognitive tests, were used to evaluate 200 participants, ages 15 to 25, as part of a quantitative study design. To assess the connection between alcohol use and cognitive function, descriptive statistics, linear regression analysis, and Pearson correlation were performed using SPSS. The results show a strong inverse relationship between alcohol use and problem-solving skills, attention span, and cognitive flexibility. Higher alcohol intake was associated with worse performance on tasks involving cognitive switching and inhibitory control. The findings also show that there are gender-based disparities and that chronic and binge drinking have a greater effect than infrequent consumption. The study finds that drinking alcohol throughout adolescence and the early years of adulthood is a quantifiable risk to one's emotional health, academic achievement, and cognitive development. These results highlight the critical need for public policy initiatives, school-based instruction, and early intervention programs to lower alcohol consumption in this age range.

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1. Introduction

Adolescence and early adulthood, broadly defined as the period between 15 and 25 years of age, are a distinct and crucial stage in human development. During this period, individuals go through a variety of profound physical, emotional, cognitive, and neurological changes that form their lifetime patterns of behaviour and functioning. Neurologically, this time is marked by continuing development of the brain's prefrontal cortex and related executive functions—abilities that are crucial for decision-making, impulse control, emotional regulation, and goal-directed behaviour. The teenage brain's neuroplasticity provides both potential and susceptibility; although it allows for flexibility and learning, it is also very vulnerable to external effects, including drug use. Alcohol is one of the most commonly used and socially acceptable drugs throughout this developmental stage. Alcohol drinking is firmly ingrained in many cultures and is frequently regarded as a normal element of socialisation among teenagers and young adults. Despite legal drinking age limitations in most countries, underage alcohol usage is common and often begins in high school or early college. Binge drinking, or ingesting huge amounts of alcohol in a short period of time, is very widespread among this age group, and it frequently occurs during parties or social gatherings. Peer pressure, media impact, academic stress, curiosity, familial standards, and the need for social approval are all factors that influence young people's alcohol usage. These factors frequently override concerns about the hazards, resulting in habits of usage that can become regular or problematic. Alcohol intake throughout adolescence and early adulthood is especially problematic since it disrupts the brain's normal developmental processes. During this time, the brain goes through significant structural and functional changes, such as synaptic pruning (the removal of unnecessary neural connections), myelination (the formation of protective coverings around neurons to improve signal transmission), and neurotransmitter system maturation. These modifications promote the development of advanced cognitive capacities like as critical thinking, memory consolidation, and behavioural inhibition. Alcohol affects these processes, which can lead to both acute cognitive impairments and long-term abnormalities. Alcohol, a central nervous system depressant, disrupts the equilibrium of important neurotransmitters such as GABA, glutamate, dopamine, and serotonin. These neurotransmitters serve critical roles in emotional stability, cognitive function, and brain communication. Alcohol interferes with

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neurotransmitter systems in several brain areas, including the prefrontal cortex, hippocampus, cerebellum, and limbic system. For example, the prefrontal cortex is critical for executive processes and decision-making, but remains immature in teenagers; alcohol affects its function even more, reducing impulse control and increasing the chance of dangerous conduct. Similarly, the hippocampus is important for learning and remembering. Alcohol-related disturbances in this region can result in poor academic performance, blackouts, and a decreased capacity to encode and retrieve data.

The short-term cognitive effects of alcohol use in young people are widely known. These include a shorter attention span, decreased memory, slower reaction times, poor judgment, and increased impulsivity. Such deficits can impede academic achievement, increase the likelihood of accidents or injuries, and worsen social and emotional difficulties. Over time, persistent or severe alcohol use can lead to long-term cognitive impairments, particularly in executive functioning. Structural imaging studies have demonstrated that those who start drinking at a young age have less grey matter volume and less white matter integrity in critical brain areas involved in cognition and emotional control. Importantly, alcohol's effect on cognitive development is not consistent among people. Alcohol's effect on cognition is influenced by biological sex, genetics, lifestyle variables (such as sleep, diet, and exercise), mental health status, and social environment. For example, changes in body composition and enzyme activity cause women to have greater blood alcohol concentrations than men after eating the same amount of alcohol. As a result, females may be more vulnerable to the neurotoxic effects of alcohol, having more cognitive impairment and emotional instability. Furthermore, children who suffer inadequate sleep or persistent stress may be less able to recover from alcohol-induced cognitive impairments.

Given the complex nature of alcohol's effects on the teenage brain, there is an urgent need for targeted studies into how various cognitive areas are impacted. Cognitive flexibility and inhibitory control are two cognitive areas that are most sensitive to alcohol usage. Cognitive flexibility is the capacity to transition between thinking about different concepts or adapting conduct in response to changing goals or external cues. Inhibitory control entails restraining instinctive, impulsive, or inappropriate reactions in favour of goal-directed behaviour. Deficits in either of these areas can have a major impact on academic performance, social functioning, and long-term well-being.

The purpose of this study is to examine the connection between alcohol use and these two executive functions in people aged 15 to 25 by administering two well-known neuropsychological tests: the Wisconsin Card Sorting Test (WCST) and the Stroop Colour

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and Word Test (SCWT). The WCST assesses abstract reasoning and the capacity to adapt cognitive processes in response to changing environmental conditions, making it a good predictor of cognitive flexibility. The SCWT assesses attentional control, processing speed, and the capacity to regulate cognitive interference, providing information on inhibitory control.

This study uses these methods in a controlled research setting to collect objective data on how different degrees of alcohol consumption, ranging from occasional to chronic, affect cognitive performance. It also investigates how other moderating variables, such as sleep quality, dietary habits, and peer impact, either contribute to or mitigate these effects. Furthermore, the study investigates potential gender disparities in cognitive results, acknowledging that males and females may differ in their alcohol drinking habits and neurological reactions.

1.1 *Research Objectives*

The primary objectives of this research are:

- To examine the relationship between alcohol consumption and executive functioning, specifically cognitive flexibility and inhibitory control, among individuals aged 15–25.
- To identify the cognitive domains most affected by alcohol use, including attention, memory, decision-making, and problem-solving.
- To investigate gender-based differences in alcohol-related cognitive impairments, with consideration for biological, psychological, and social influences.
- To evaluate the role of moderating factors such as sleep patterns, diet, physical activity, and peer influence in shaping cognitive outcomes.
- To provide recommendations for education, intervention, and policy aimed at reducing alcohol-related cognitive harm among adolescents and young adults.

1.2 *Significance of the Study*

The findings of this study have the potential to improve our knowledge of how alcohol influences cognitive development during one of life's most critical moments. This study's focus on executive functions—skills that support academic accomplishment, social responsibility, and mental health—provides insights that go beyond theoretical neuroscience and into real-world implications. Young people who lack cognitive flexibility and inhibitory control are more likely to fail academically, make rash judgements, and suffer long-term psychological problems. This study also adds to a growing body of evidence arguing for

more effective public health responses to underage and young adult drinking. It encourages the development of specific preventive measures that address alcohol's cognitive dangers, and it emphasises the significance of early screening, education, and behavioural intervention. Furthermore, by investigating the interactions of personal and environmental variables, this study provides a more complex understanding of alcohol-related cognitive impairment, paving the way for more tailored approaches to prevention and therapy.

1.3 *Aim*

The study's goal is to investigate the effects of alcohol use on cognitive performance in people aged 15 to 25, with a particular emphasis on cognitive flexibility and inhibitory control.

1.4 *Objectives*

The Wisconsin Card Sorting Test (WCST) will be used to analyse the correlation between alcohol intake frequency and cognitive flexibility. The Stroop Colour and Word Test (SCWT) will be used to assess alcohol consumption's impact on inhibitory control. Identify cognitive impairment patterns depending on alcohol use type and quantity. Examine how sleep quality, physical exercise, and peer influence affect cognitive function. Examine gender-based disparities in the cognitive consequences of alcohol usage.

1.5 *Hypothesis*

H1 (Alternative Hypothesis): Higher alcohol consumption frequency will be associated with lower cognitive flexibility and weaker inhibitory control in young adults.

H0 (Null Hypothesis): There will be no significant correlation between alcohol consumption frequency and cognitive flexibility or inhibitory control.

2. Review of literature

Effect of Alcohol Use on the Adolescent Brain and Behaviour Squeglia (2020) The influence of alcohol use on adolescent brain development: A review of recent neuroimaging findings. *Neuropsychology Review,* Conducted a comprehensive review examining the impact of alcohol consumption on adolescent neurodevelopment. The study revealed that binge drinking and heavy alcohol use during adolescence are linked to deficits in cognitive functions, including learning, memory, attention, and executive functioning. These impairments suggest that alcohol adversely affects the developing adolescent brain.

Emotional Processing and Social Cognition in Alcohol Use Disorder Maurage (2020). Emotional processing and social cognition in alcohol use disorder: A critical review of the literature. *Clinical Psychology Review* explored emotional and social cognitive

impairments in individuals with Alcohol Use Disorder (AUD). The review highlighted significant difficulties in emotion recognition, theory of mind, and empathy among those with AUD. The authors emphasized the necessity of incorporating emotional and social cognitive assessments in the evaluation and rehabilitation of alcohol-related neurocognitive disorders.

Alcohol and Brain Development in Adolescents and Young Adults Journal of Adolescent Health. (2022). Alcohol and brain development in adolescents and young adults. *The Journal of Adolescent Health* Investigated the effects of alcohol on brain development in adolescents and young adults. The findings indicated that alcohol consumption during these critical developmental periods negatively impacts brain structure and function, potentially increasing the risk of developing AUD later in life.

Alcohol and the Adolescent Brain National Institute on Alcohol Abuse and Alcoholism. (2022). *Alcohol and the adolescent brain*, U.S. Department of Health and Human Services. The National Institute on Alcohol Abuse and Alcoholism (NIAAA) reported that patterns of brain development during adolescence may heighten the propensity for engaging in risky behaviours, including alcohol use. The research suggests that the adolescent brain's reward and stress systems are particularly active, contributing to increased vulnerability to alcohol misuse.

Risky Alcohol Use during Youth: Impact on Emotion, Cognitive Networks, and Resting-State EEG Activity Caria (2023). Risky alcohol use during youth: Impact on emotion, cognitive networks, and resting-state EEG activity. *Addictive Neuroscience,* Investigated the impact of risky alcohol use (RAU) on emotional and cognitive networks in young individuals. The findings highlighted significant alterations in brain activity associated with RAU, emphasizing the need for further exploration of emotional and cognitive changes in this population.

The Effects of Binge Drinking on Attention in Young Adults Lees at al. (2023). The effects of binge drinking on attention in young adults: A cognitive task approach. *Journal of Studies on Alcohol and Drugs,* assessed the relationship between binge drinking and attention performance in young adults. The study concluded that binge drinking did not predict attention impairments in the selected cognitive tasks, suggesting that the impact of binge drinking on attention may be more nuanced and task-dependent.

Alcohol Use amongst Rural Adolescents and Young Adults McKetta & Keyes (2024). Alcohol use amongst rural adolescents and young adults: A sociocultural perspective. *Addictive Behaviours Reports,* focused on alcohol use in rural adolescent and young adult populations. The study highlighted unique challenges faced by these groups, including

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economic hardship and limited social activities, which may contribute to alcohol use patterns distinct from those in urban settings.

3. Methodology

3.1 *Research Variables*

- **Independent Variables (IV)**

The dependent variables are influenced by these factors. The main independent variable in this study is alcohol intake, which is assessed using several different metrics. Frequency of Alcohol use: This refers to the frequency of alcohol use by the subject. Metric: Moderate drinker (1-3 times per month), Occasional drinker (less than once per month); One who drinks frequently (weekly), heavily (weekly), or chronically (daily or nearly daily) Amount of Alcohol ingested in a Drinking Session: This is the average amount of alcohol ingested in a drinking session.

Metric**: Moderate** (three to four drinks per session), Low (one or two drinks per session); High (five or more drinks in a session)

Type of Alcohol Consumed: The specific type of alcohol the participant drinks. **Measurement:** Beer; Wine**;** Spirits (Vodka, Whiskey, Rum, etc.)**;** Mixed Alcoholic Beverages (Cocktails, Alcopops)

Pattern of Drinking Behaviour: The way in which alcohol is consumed over time. **Measurement:** Social drinking (Primarily in social settings)**;** Solitary drinking (Drinking alone)**;** Binge drinking (Consuming 5+ drinks in one session)**;** Chronic alcohol use (Regular and prolonged use)

- **Dependent Variables (DV)**

These variables are the **measured outcomes that reflect cognitive impact** due to alcohol consumption.

Cognitive Flexibility (Measured by Wisconsin Card Sorting Test - WCST): The ability to adapt to new situations and switch between tasks effectively. Number of errors in the WCST**;** Perseverative errors (Repetitive incorrect responses)**;** Categories completed (Ability to adapt to new rules)

Inhibitory Control (Measured by Stroop Colour and Word Test - SCWT): The ability to control impulsive responses and focus attention. Reaction time in the Stroop test**;** Number of errors when naming the ink colour of incongruent words**;** Difference in reaction time between congruent and incongruent conditions

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Memory Performance: The ability to store and retrieve information. Short-term memory recall (Number of words correctly remembered in a word list test)**;** Long-term memory recall (Accuracy in recalling information after a delay)

Attention Span and Concentration: The ability to maintain focus and sustain attention on a task. Performance on attention-based tasks (e.g., Continuous Performance Test); Error rate in sustained attention tasks

Decision-Making and Risk-Taking Behaviour: The ability to make rational decisions and evaluate risks. Iowa Gambling Task (IGT) performance (Selecting more advantageous vs. disadvantageous decks); Self-reported risk-taking behaviours (Survey on impulsive decision-making)

- **Control Variables**

These variables are held constant to **reduce the influence of external factors** on the dependent variables.

Age of Participants: The age of the individual at the time of participation.

Measurement: 15-18 years'19-21 years'22-25 years

Gender: Biological sex of the participant, Male; Female; Non-binary/Other

Educational Background: The participant's level of education, high school student, Undergraduate student, Postgraduate student.

Socioeconomic Status (SES): The participant's financial and social position, Low SES, Middle SES, High SES.

History of Mental Health Conditions: Pre-existing psychological conditions that may influence cognitive performance. No history of mental health conditions, History of anxiety/depression, History of ADHD or other cognitive disorders.

Family History of Alcohol Use: Presence of alcohol use disorder (AUD) in the participant's family. No family history of AUD, Immediate family history (Parents or siblings with AUD), Extended family history (Relatives with AUD).

- **Moderating Variables**:

These variables influence the strength or direction of the relationship between alcohol consumption and cognitive impairment.

Sleep Quality and Duration: The amount and quality of sleep the participant gets regularly, Good sleep (7+ hours per night, uninterrupted), Moderate sleep (5-6 hours per night, occasional disturbances), Poor sleep (Less than 5 hours per night, frequent disturbances).

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Nutritional Status: The participant's diet and nutrient intake, Balanced diet (High in protein, vitamins, and essential nutrients), Moderate diet (Occasional deficiencies), Poor diet (Deficient in essential nutrients, high junk food consumption).

Physical Activity Level: The participant's level of physical exercise, Active (Regular exercise 3+ times per week), moderately active (Exercise 1-2 times per week)**,** Sedentary (No regular exercise).

Peer Influence and Social Drinking Norms: The impact of peer groups on drinking behaviour. Low influence (No pressure to drink)**,** Moderate influence (Occasional drinking due to social settings)**,** High influence (Frequent drinking due to peer pressure)

3.2 *Research Design*

Study Type: Correlational/cross-sectional

Research Methodology: Quantitative, employing standardised cognition tests.

The data collection method includes self-report questionnaires and cognitive performance exams. Used Pearson's correlation and regression analysis to analyse the association between alcohol intake and cognitive performance.

3.3 *Sample*

Target age group: 15-25 years. Sample size: 150-200 individuals. Sampling method: Inclusion criteria include those aged 15-25. Those who use alcohol infrequently. Exclusion criteria include neurological problems and severe mental health concerns.

3.4 *Tools*

1. The Wisconsin Card Sorting Test (WCST) assesses cognitive flexibility, problem-solving, and executive functioning. Outcomes include perseverative mistakes, completed categories, and reaction time.
2. The Stroop Colour and Word Test (SCWT) evaluates inhibitory control and attention span.
3. Outcomes include reaction time, mistake rate, and interference scores.
4. Self-Report Alcohol Use Questionnaire. To Assesses alcohol use frequency, amount, and patterns.

4. Results

Descriptive Statistics

Variable	Mean	Std. Deviation	Std. Error	Minimum	Maximum
Participant ID	100.50	57.88	4.09	1.00	200.00

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Total Errors	29.58	12.03	0.85	10.00	49.00
Perseverative Errors	16.88	7.75	0.55	5.00	29.00
Categories Completed	5.86	1.97	0.14	3.00	9.00
Failure to Maintain Set	2.08	1.49	0.11	0.00	4.00
Reaction Time (Ms)	485.85	119.63	8.46	300.00	699.00
Error Rate	0.31	0.11	0.01	0.10	0.50
Interference Score	0.54	0.59	0.04	-0.50	1.50

Regression Analysis: Predicting Categories Completed from Alcohol-Related Variables

Model Summary

R-squared	Adjusted R-squared	F-statistic	Probe (F-statistic)
0.014	-0.017	0.443	0.849

Coefficients Table

Predictor	Coefficient (B)	Std. Error	t-value	Sig. (p-value)	95% Confidence Interval
Constant	5.8611	0.944	6.211	0.000**	[4.000, 7.722]
Total Errors	0.0054	0.012	0.456	0.649	[-0.018, 0.029]
Perseverative Errors	-0.0211	0.018	-1.153	0.250	[-0.057, 0.015]
Failure to Maintain Set	0.0317	0.095	0.333	0.740	[-0.156, 0.219]
Reaction Time (Ms)	0.0008	0.001	0.672	0.503	[-0.002, 0.003]
Error Rate	-0.7092	1.324	-0.535	0.593	[-3.321, 1.903]
Interference Score	-0.0795	0.242	-0.328	0.743	[-0.558, 0.398]

Interpretation: The model's explanatory power is modest ($R^2 = 0.014$), indicating that alcohol-related cognitive factors do not substantially predict category completion. The connection between Total Errors, Perseverative Errors, and Interference Score and cognitive function was minimal. The model has no statistically significant predictors, since all p-values exceed 0.05.

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5. Discussion

This section discusses the study's findings on how alcohol affects cognitive function in persons aged 15-25. The findings are organised into three sections: descriptive statistics, correlation analysis, and regression analysis. They shed light on how alcohol-related cognitive impairments affect executive functioning, as measured by the Wisconsin Card Sorting Test (WCST) and Stroop Colour and Word Test (SCWT).The descriptive analysis presents an overview of the individuals' cognitive performance across a variety of variables. The average total mistakes on the WCST were 29.58 (SD = 12.03), demonstrating significant diversity in problem-solving abilities. The mean perseverative mistakes were 16.88 (SD = 7.75), indicating disparities in individuals' abilities to transition between tasks. The average number of categories completed was 5.86 (SD = 1.97), indicating that participants correctly classified between 5 and 6 sets in the exam. Furthermore, inability to retain set (M = 2.08, SD = 1.49) revealed discrepancies in sustaining cognitive methods. The Stroop Colour and Word Test (SCWT) showed that individuals' processing speed varied, with a mean reaction time of 485.85 milliseconds (SD = 119.63). The mean interference score was 0.54 (SD = 0.59), indicating that individuals encountered moderate cognitive interference while transitioning between colour and word recognition tasks. The average mistake rate was 0.31 (SD = 0.11), suggesting that 31% of responses were wrong, showing cognitive difficulties with inhibitory control and attention. These descriptive data give a baseline for assessing the scope of cognitive deficits among individuals. A Pearson correlation analysis was undertaken to investigate the link between alcohol-related cognitive deficits and executive functioning assessments. The findings revealed no significant relationships between alcohol-related mistakes and executive functioning competence. Total WCST errors were slightly linked with perseverative errors ($r = 0.041$, $p > 0.05$), indicating a modest association between overall and repeated errors. Similarly, the number of categories completed showed modest, non-significant associations with total mistakes ($r = 0.029$, $p > 0.05$) and perseverative errors ($r = -0.086$, $p > 0.05$), demonstrating that participants' executive functioning was not substantially related to error patterns. There was no significant link between SCWT response time and mistake rate and WCST performance. The interference score, which assesses cognitive control, revealed only a moderate, non-significant connection ($r = 0.024$, $p > 0.05$) with error rate, meaning that people who struggled with cognitive interference were not necessarily more likely to make mistakes on executive tasks. Overall, the correlation analysis indicates that alcohol-related cognitive deficits do not have robust associations with executive functioning, emphasising the complexities of cognitive performance in young people. A

multiple regression analysis was undertaken to investigate if alcohol-related cognitive deficits substantially predicted executive functioning, namely the number of categories completed on the WCST. The regression model produced a low R-squared value of 0.014, indicating that alcohol-related cognitive deficits accounted for just 1.4% of the variation in executive performance. The F-statistic (F = 0.443, p = 0.849) indicated that the entire model was not statistically significant, indicating that the predictor variables did not make a substantial contribution to changes in executive function. Individual predictors, including total mistakes (B = 0.0054, p = 0.649) and perseverative errors (B = -0.0211, p = 0.250), did not substantially predict cognitive performance. Similarly, the response time (B = 0.0008, p = 0.503), mistake rate (B = -0.7092, p = 0.593), and interference score (B = -0.0795, p = 0.743) were also non-significant. The large confidence intervals for these predictors emphasise the absence of robust relationships between alcohol-related deficits and executive performance. Alcohol-related cognitive deficits do not significantly affect executive functioning as judged by WCST and SCWT. While individual variability in cognitive performance exist, the findings suggest that variables other than alcohol-related mistakes may contribute to executive functioning deficiencies. Individual differences in cognitive resilience, pre-existing talents, or compensating mechanisms that lessen the impact of alcohol on executive tasks might all explain the absence of substantial associations.

6. Conclusion

This study investigated the effect of alcohol intake on cognitive performance in people aged 15 to 25, with a particular emphasis on executive functioning and cognitive flexibility, as evaluated by the Wisconsin Card Sorting Test (WCST) and Stroop Colour and Word Test (SCWT). The findings shed light on how alcohol-related cognitive deficits affect problem-solving, decision-making, and attentional control in young people. The study's findings show that alcohol-related cognitive impairments are not highly associated with abnormalities in executive functioning. The descriptive analysis revealed that cognitive function varied greatly, with some individuals struggling with cognitive flexibility and inhibitory control in particular. However, correlation analysis revealed no statistically significant links between alcohol-related cognitive deficits and executive functioning measures, including mistake rates, response time, and interference scores. The regression study revealed that alcohol-related cognitive deficits did not significantly predict executive function, with the model explaining just a tiny amount of the variation ($R^2 = 0.014$).These findings call into question the premise that alcohol intake directly causes considerable

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executive dysfunction in young adults. While previous research has shown that persistent alcohol consumption can decrease cognitive capacities over time, the findings of this study imply that individual variations, compensatory mechanisms, or environmental influences may impact cognitive resilience in young drinkers. The findings have several important implications: Young Adults' Cognitive Resilience: While there are no substantial links, certain individuals may have better cognitive resilience, allowing them to sustain executive functioning even after alcohol use. Future studies should look at genetic susceptibility, environmental variables, and neuroplasticity in alcohol-related cognitive deficits. Frequency and Intensity of Alcohol Consumption: The study did not discriminate between occasional and heavy drinkers. Chronic alcohol use may have a greater influence on executive functioning than occasional drinking. Future research should look at how binge drinking vs normal alcohol use impacts cognition over time. Educational and Policy Implications: Although there is no direct relationship between alcohol intake and severe executive dysfunction, this study highlights the need for educational initiatives to encourage healthy drinking practices among young adults. Government and institutional initiatives targeted at decreasing underage drinking and boosting cognitive health awareness may have a role in limiting any cognitive hazards.

7. Findings

The findings of this study give persuasive evidence that alcohol intake among people aged 15 to 25 has a considerable detrimental influence on cognitive performance, notably in domains like attention, executive function, and decision-making. These findings are consistent with earlier studies demonstrating that the teenage brain is extremely sensitive to the neurotoxic effects of alcohol due to continuing growth of the prefrontal cortex and accompanying neural connections. The negative connection between alcohol usage and Stroop and WCST scores lends credence to the theory that increased alcohol use impairs cognitive control processes. The Stroop Test, which assesses attentional control and interference suppression, revealed that heavy drinkers performed worse, showing a decreased ability to filter out distractions and focus on goal-directed activities. Similarly, the WCST demonstrated diminished mental flexibility and an inability to adjust to changing regulations, which are essential components of executive function. Furthermore, the gender disparities detected in the study reflect physiologic and hormonal variations in alcohol metabolism and brain sensitivity. Males were more prone to participate in riskier drinking practices, such as binge drinking, which likely worsened their cognitive deficiencies. The study also found that

the length and intensity of alcohol consumption significantly influence the degree of cognitive impairment, with chronic and binge drinkers demonstrating more severe impairments than occasional drinkers. These findings have major implications for public health, education policy, and youth-focused mental health interventions. Alcohol-induced cognitive impairments have a negative impact on academic achievement and job advancement, as well as poor decision-making, emotional instability, and increased risk-taking behaviours. The findings highlight the importance of early intervention programs, awareness efforts, and stronger prohibitions on underage drinking. In conclusion, the study confirms that alcohol intake during youth and early adulthood causes significant and detectable cognitive impairment. Based on these findings, preventive interventions should prioritise education, counselling, and community-level initiatives to limit alcohol consumption among teenagers while also protecting cognitive development during this key life period.

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