

Alcohol and brain development in adolescents and young adults

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Executive summary

Health Council of the Netherlands



Alcohol consumption poses risks. It can lead to accidents, violence and other transgressive behaviour, and many diseases and disorders. Alcohol is harmful, especially for young people. For example, they become intoxicated more quickly than adults. The government would like to protect young people; in 2014, it increased the minimum age for purchasing alcohol from 16 to 18 years. Another reason that alcohol for young people may be more harmful than for adults is that their brains are still developing. It is assumed that alcohol negatively influences that development. To gain more clarity on this matter, the State Secretary for Health, Welfare and Sport asked the Health Council of the Netherlands what, according to the latest knowledge, is known about the effects of alcohol on the brains of young people between the ages of 12 and 24 years. The State Secretary also asked to evaluate the consequences of alcohol consumption at a young age on the use of alcohol in adulthood. To answer these questions, the Council set up the Committee on Alcohol and the Brain which, in addition to

research on changes that can be measured in the brain itself, also focuses on research on the association between alcohol consumption and cognitive functions and educational achievement in young people. For the question about the influence of alcohol consumption at a young age on the use of alcohol in adulthood, the Committee specifically focuses on alcohol use disorder, which means that someone's activities, behaviour or relationships suffer or that someone has difficulty stopping, cutting back or is addicted.

Research on alcohol consumption

A lot of research is available on the influence of alcohol consumption on the brains of young people, but some of it is unsuitable for use because the studies are not designed to answer the research questions from the Committee. The studies that are suitable are often too different to make a comparison. For example, the quantities of alcohol or the outcome measures vary widely between studies. Some of the scientific publications are also based on research data on

the same group of young people, which means that they have less explanatory power than if they were based on independent data. In addition, research on alcohol consumption has several inherent limitations. For example, it is difficult to separate the consequences of alcohol consumption from the consequences of other risky behaviour that often occurs simultaneously, such as smoking, drug use or truancy. In experimental animal research, it is possible to measure the effects of alcohol alone, but these findings cannot be directly translated into effects in humans. Moreover, the doses studied in animals are sometimes unrealistically high. In this advisory report, the Committee therefore primarily focused on research in humans.

Structure and activity of the brain

In research on the development of the brain, the structure of the brain can be examined, e.g. the volume of different areas of the brain. A distinction is made between grey matter and white matter. Another way is to study activity in the brain, for example, while someone is



performing a task. No judgement can be made on the relationship between alcohol consumption and the white matter because not enough studies are available. In other words, fewer than the criterion set by the Committee of at least three studies of sufficient quality, each of which is based on a different study population. For alcohol consumption and brain activity, the studies are too different to make an assessment. Only for grey matter, a sufficient number of studies of sufficient quality are available to draw conclusions. From these studies, the Committee concludes that there are indications that the volume of grey matter in the brain shows an abnormal and accelerated decline in young people who drink.

Cognitive functioning

Cognitive functions include memory, concentration, decision-making, learning ability and planning. In a number of studies of sufficient quality, associations have been found between the degree of alcohol consumption and impaired cognitive functioning in young people. However,

these studies are largely based on data from the same research populations. Other caveats are that a variety of cognitive tests have been used – making the data difficult to compare – and that in some studies a large number of cognitive outcomes (test results) have been reported, which increases the possibility of chance findings. The Committee therefore concludes that the relationship between alcohol consumption and cognitive functioning is still unclear.

Educational achievement

In approximately half of the studies, young people who drink alcohol perform worse at school than young people who do not drink: they achieve a lower level of education or leave school without a diploma. Nevertheless, the Committee concludes that the connection between alcohol consumption and educational achievement is still unclear. In the analysed studies, it is difficult to establish the extent to which the risk of early school leaving at the start of the study already differed among the

participants. As a result, it is possible that poorer educational achievement is not the *result* of alcohol consumption but the *cause*. It can also not be ruled out that the associations found are caused by a so-called ‘third factor’, for example, personality characteristics such as risk-avoiding or risk-seeking behaviour, which is related both to higher alcohol consumption and poorer educational achievement. The Committee therefore concludes that the relationship between alcohol consumption and educational achievement is still unclear.

Alcohol use disorder later in life

It is known that there is a connection between drinking at a young age and alcohol consumption later in life, which in itself already entails health risks. The Committee specifically focused on alcohol use *disorder* later in life. The Committee concludes that there are indications that starting drinking at a young age is associated with a higher risk of developing alcohol use disorder later in life, such as alcohol addiction. The more often they drink, or the



younger they start, the higher this risk. The Committee notes, however, that starting age as a measure for exposure to alcohol has its limitations. The question is whether the age of the first experience with alcohol is in itself an important risk factor in contrast to, for example, the age at which someone starts drinking regularly or is drunk for the first time.

Conclusions

It did not appear to be possible to answer the question whether the *degree* of alcohol consumption influences the possible consequences and whether the consequences are reversible. It is known that alcohol

consumption leads to risky behaviour and health risks. That is why the advice for the general population is not to drink alcohol, or at least not more than 1 glass a day. Young people are particularly vulnerable. Not only are they more likely to develop alcohol intoxication, but their brains are still developing. Overall, in the research results assessed, the Committee sees indications that alcohol consumption can have a negative influence on this brain development and entails a risk of later alcohol use disorder. The Committee therefore considers it a wise choice for young people not to drink alcohol.



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