

Alcohol and Adolescence: Briefing Paper from Scottish Health Action on Alcohol Problems



SHAAP

SCOTTISH HEALTH ACTION ON ALCOHOL PROBLEMS
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In September 2013, Scottish Health Action on Alcohol Problems (SHAAP) held an expert workshop to examine the evidence of the impact of alcohol on the developing adolescent brain and to consider the implications for health promotion and policy.

This briefing paper provides a discussion of the key findings in advance of a final report. ¹ This will inform a discussion with an invited audience at the Scottish Parliament on 5th November 2013. The final report will also include conclusions from the discussion.

Rationale

SHAAP's core purpose is to provide a co-ordinated, coherent and authoritative medical voice on alcohol related harm. On this basis, we examined recent medical and scientific research which suggests that alcohol has a distinct impact on the adolescent brain, different from the impact it has on adults, posing a particular danger to the developing brain faculties of executive functioning and long term memory.

Developments in neuro-science and genetics have indicated that some young people may be differently affected by alcohol than others; for instance in the extent to which some find alcohol consumption particularly rewarding. When we combine scientific and medical evidence with what we know about Scotland's relatively high level of alcohol consumption, compared to the rest of Europe, there is a clear need to explore how alcohol impacts on young people.

SHAAP brought together experts from the fields of genetics, neuro-science, social psychology and policy makers to explore and critically review the evidence about the health impacts and risks associated with alcohol use amongst adolescents. We felt it was important to take a holistic and multi-disciplinary approach to this subject, drawing on the insight offered by different specialisms.

Our intention has been to understand adolescent drinking and its impacts rather than to criticise young people's behaviour. It is important to note that adolescence can be a period of sensation seeking and experimentation and this can often have a positive element as young people develop the skills and knowledge they need in later life.

Patterns of alcohol use amongst adolescents

By the age of 15 most young people in Scotland have consumed alcohol at some point. A quarter to one third reported regular drinking. Living in deprived areas is related to a much higher frequency of alcohol problems.² Young people, in general, are drinking less often than in 2000, albeit from a historically high level, those who are drinking are drinking more.

There has been a notable rise in proportion of young Scottish offenders who consider alcohol has contributed to their offending (from 48% in 1979 to 80% in 2007).³

Understanding 'adolescence'

Adolescence can be defined as the period of physical, psychological and social transition between childhood and adulthood.⁴ Adolescence is, therefore, a time characterised by change, yet until fairly recently this period of life was relatively neglected by cognitive neuroscience.

Until recently, it was widely held that the brain was anatomically mature from childhood, and that changes in social behaviour during the teens were a result of hormones, social experience, peer influence and the changing social environment. However, advances in the field of magnetic resonance imaging (MRI) in the last couple of decades have provided evidence that the structure of the brain develops over a long period, up to the age of 25.

One key example of the on-going development in the adolescent brain is a process called 'pruning' (discarding parts of the brain that are inactive and strengthening connections that are frequently used). In adolescence this pruning takes place in the prefrontal cortex – the area at the front of the brain responsible for planning, personality expression, and decision making and moderating social behaviour.

There is a 'tension' in the adolescent brain between a well-developed emotional intensity and appetitive drive, alongside deficient regulation or 'top down control' from the frontal cortex which develops somewhat later.

Alcohol and the adolescent brain

Animal and human studies suggest that adolescents are more susceptible to the acute effects of alcohol and that early onset drinking (particularly heavy drinking) increases the likelihood of alcohol disorders developing in later life.⁵

Research with rats has explored the impact of repeated alcohol exposure on the brain at different ages.⁶ The regions of the brain susceptible to alcohol-induced brain damage were found to differ between adolescent rats and adult rats; adolescents showing more damage in the frontal brain regions, whereas in adults the damage was greater in the posterior regions.

Brain imaging has revealed structural differences in human adolescents who are heavy drinkers and those who are not; however the findings are not consistent across different studies. For example, there is evidence that alcohol may reduce the volume of the hippocampus, a part of the brain concerned with spatial navigation and short and long term memory. Another example is that alcohol can impede the

effectiveness of that part of the brain which affects learning. This is consistent with studies in adolescent rats, where alcohol selectively impairs spatial memory, whereas adult rats are unaffected by the same doses.⁷

It is also suggested that acute and chronic alcohol consumption in adolescence could result in long term changes in brain circuitry as a result of its impact on neurotransmission.⁸ Given that the frontal cortex is maturing during this time, such alterations might therefore result in enduring deficits in control of emotion, logical thinking and inhibition of impulsivity. In turn this lack of executive control may exacerbate addictive tendencies and result in greater habituation to alcohol.

Our understanding of the adolescent brain has been enhanced by research in genetics which aims to explain the degree to which individual behaviour is affected by genetic make-up. Research suggests that some young people are more predisposed to substance misuse than others. Links have also been established between the speed of the inhibition process and tolerance for psychoactive substances. This may imply that some people need to consume more than their peers in order to achieve the same effect from a substance.⁹

Alcohol and adolescence: What are the policy implications?

The evidence presented at the workshop supports the argument that alcohol has a particularly adverse impact on the adolescent brain because the latter's architecture is still being shaped and a 'chemical insult' at this time may have long term implications.

Some of the practical and policy implications of these findings are considered below. It should be clear that policies which target subgroups with particular needs are in no way incompatible with the overarching need to promote a population approach to reducing alcohol related harm.

- Work to support young people needs to be informed by the fact that, in terms of brain development, adolescence goes beyond teenage years into adulthood. Up until now clinical treatments, support services and licensing legislation have often been based on equating 'adulthood' with being 18 or over.
- If we are to support young people to reduce potentially harmful alcohol use we need to think about the types of services that exist and the extent to which they are accessible and appropriate to their needs.
- Serious consideration needs to be given to how we share emerging data with young people who may be relatively unconcerned about the long-term implications of their drinking behaviours.
- Available research evidence offers the potential for health care practitioners and others working with young people to identify 'at risk' groups; for example those exceptionally prone to impulsiveness and risk taking; those involved in criminal offending; those with a history of heavy alcohol use at an early age or those with a family history of alcohol misuse.

- We need more studies to tease out particular pre-existing vulnerabilities, such as fetal exposure, family history, personality variables. There is currently limited understanding of the interaction between gender, hormonal changes at puberty, family experience, culture and the environment influence brain development.
- Research into alcohol and the developing brain is at an early stage and we need to know more about the long term impacts of alcohol use. Functional neuroimaging studies at different stages of adolescence and gender comparisons are also required. It may also be useful for researchers to take account the pubertal stage of development rather than simply age.
- The link between social deprivation and harmful alcohol also needs to be addressed in relation to young people. Targeted services need to address alcohol misuse alongside reducing social and economic marginalisation.
- A long term prospective study involving alcohol-naïve children and continuing across adolescence and into young adulthood would help us to understand the extent to which alcohol exposure or the pattern of alcohol use, during development has long-term effects on cognition and the psychological profile of young people.
- Alcohol is a major cause of morbidity and mortality across the world. The acute effects of alcohol on the young can have extreme and occasionally lifelong consequence. As well as focusing on how much young people drink, we also need to understand 'why' they drink and why, in particular, some groups drink more than others and/or drink stronger alcohol. If Scotland is seriously committed to "Getting it right for every child"¹⁰ then policies that protect young people from alcohol related harm should be a priority. Paying attention to emerging evidence of how the brain changes during adolescence needs to inform policy development.

References

- 1 The views expressed in this paper are those of SHAAP alone and do not necessarily reflect the views of the workshop participants.
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- 9 Norman AL, Pulido C, Squeglia LM, Spadoni AD, Paulus MP, Tapert SF. *Neural activation during inhibition predicts initiation of substance use in adolescence*. Drug Alcohol Depend. 2011 Dec 15;119(3):216-23.
- 10 A guide to Getting it right for every child: <http://www.scotland.gov.uk/Topics/People/Young-People/gettingitright/publications/practice-guide>



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