ALCOHOL HANGOVER

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SWINBURNE UNIVERSITY OF TECHNOLOGY

OBJECTIVES

The presentation will describe:

ALCOHOL HANGOVER

WHAT IS IT

Definition, symptoms, factors affecting severity

WHY IT HAPPENS

hangover

WHY IT MATTERS

workplace

WHERE TO NOW

Aspects of current research and future plans

Alcohol metabolism, physiological changes that occur with

Implications of hangover on brain function, driving ability and the

WHAT IS ALCOHOL HANGOVER?

By definition, the hangover commences once BAC approached 0.00% (Verster et al. 2020).

Common symptoms include headache, nausea, fatigue, difficulty concentrating, 'hangxiety', regret etc (Benson, 2020).

Hangover severity is effected by:

- peak BAC
- whether food was recently eaten (empty stomach = worse hangover)
- drink type (congeners = worse hangover)
- age (anecdotal reports for being worse with age)
- individual variations in ethanol metabolism
- hangover "cures"? Maybe one day soon!



WHAT CAUSES HANGOVER?

The body can typically process 1 drink per hour (i.e. BAC of 0.01%/hr)

When an excessive amount of alcohol is consumed, the chemicals involved in ethanol metabolism become depleted, and acetaldehyde levels build up

Acetaldehyde is toxic and causes significant damage, particularly to:

- the liver, where the bulk of metabolism takes place
- pancreas and other tissues where alcohol is metabolised
- the brain, damaging cells and tissue

The ethanol metabolism process and the resulting damage varies greatly between people. Genetic variations to the dehydrogenase genes delay acetalydehyde processing, resulting in hangover like symptoms and "facial flushing", making alcohol effects not enjoyable and thus, these genetics variations result in some protection from alcoholism.

(microsomes)

Ethanol

H₃C-CH₃-OH

Alcohol dehydrogenase

Catalase

(peroxisomes)

P4502E*



THE HUNGOVER BODY

A series of complex physiological changes occur with a hangover. Those with the most supporting evidence are (Tipple et al., 2016):

- oxidative stress: damages fats, proteins & DNA, with implications associated with cardiovascular disease, diabetes, Parkinson's and Alzheimer's disease

- hormonal fluctuations: particularly cortisol, insulin, testosterone epinephrine and norepinephrine
- dehydration
- changes to the immune system: cytokines IL-10, IL-12, TNFa

- glutamate rebound: Alcohol stimulates GABA (inhibitory) and blocks glutamate (excitatory) resulting in relaxed feeling, body compensates to reduce GABA and increase glutamate & this continues after drinking, resulting in unnaturally low GABA function & a spike in glutamte = hangoxiety (also leads to withdrawal seizures)

Hangovers are an illness, German court rules

Judges decide hangover cure products making unlawful health claims

So in Germany, sick days can be used for hangover



HANGOVER AND THE BRAIN



Perceived Effort

Andrew Scholev^{1,*}

Article



Hangover resulted in:

- low alertness and contentment, and high
- mental fatigue and anxiety
- reduced multi-tasking ability
- greater self-reported mental demand, effort, frustration and decreased level of performance

So, when hungover people perform badly, and are aware of it, but aren't able to compensate - possibly because cognitive resources are already too depleted or, they just don't care

Alcohol Hangover and Multitasking: Effects on

Mood, Cognitive Performance, Stress Reactivity, and

Sarah Benson¹, Elizabeth Ayre¹, Harriet Garrisson¹, Mark A Wetherell^{1,2}, Joris C Verster^{1,3} and



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HANGOVER AND DRIVING Effects of alcohol hangover on simulated highway



ane cente

I ane cente



b -2.4 cm + 2.4 cm 0.05 0.04 0.02 -5 10 15 5. impairment improvement 2.4 cm = BAC of 0.05%07

driving performance

Joris C. Verster 🖂, Adriana C. Bervoets, Suzanne de Klerk, Rick A. Vreman, Berend Olivier, Thomas Roth & Karel A. Brookhuis

> - 50% of participants showed an SDLP greater than drink driving

- Magnitude of driving impairment found in this study, is comparable to driving with a BAC of between 0.05% and 0.08% i.e. illegal impairment in most countries!

- Other (unpublished) research shows that 22.5% drivers admitted to trauma unit or fatally injured had a positive EtG (metabolite of ethanol) reading

HANGOVER AND THE WORKPLACE

- It's estimated that 1.6 million work days were lost in Australia due to alcohol use in 2013, at a cost of \$3 billion (Roche et al., 2016).

- The US Centre for Disease control estimates that hangover costs the American economy \$179 annually (Centre for Disease Control, 2015).

- These costs are largely the result of absenteeism.

- Losses would be much higher when factoring in the impact of hangover on workplace lateness, reduced productivity, increased injury risk and increased personal conflicts.



Where Assessing the efficacy of several Test the glutamate to Now? hangover rebound theory treatments using fMRI currently sold in Australia We're currently running several studies to improve our Develop an understanding, objective measure guide policy, Determine of hangover, for biomarkers related educate example, a to hangover Australians and breathalyser or $\oplus \equiv$ reduce risk blood test

Collaborations

We're always open to discussing research ideas and collaborations so please get in touch

Compare driving performance in people when they're sober, drunk and hungover

Assess the relationship between alcoholism and hangover per se

Identify personality factors associated with hangover severity, e.g. resilience, coping,

etc



Determine whether hangover really does get worse with age



REFERENCES

Benson, S., Ayre, E., Garrison, H., Wetherell, M., Verster, C., Scholey, A. (2020). Alcohol hangover and multitasking: effects on mood, cognitive performance, stress reactivity and perceived effort. *Journal of Clinical Medicine*, 9, 1154; doi: 10.3390/jcm9041154

Centre for Disease Control (2008). The cost of excessive alcohol use.

Roche, A., Pidd, K., Kostadinov, V. (2016). Alcohol and drug related absenteeism: a costly problem. *Australian and New Zealand Journal of Public Health*, 40(3), 236-238; doi: 10.1111/1753-6405.12414

Verster, J., Scholey, A., van de Loo, A., Benson, S., Stock, A.K. (2020). Updating the definition of the alcohol hangover. *Journal of Clinical Medicine*, 9, 823; doi: 10.3390/jcm9030823

Verster, L., Bervoets, A., de Klerk, S., Vreman, R., Olivier, B., Roth, T., Brookhuis, K. (2014). Effects of alcohol hangover on simulated highway driving performance. *Psychopharmacology*, 231(15), 2999-3008; doi: 10.1007/s00213-014-3474-9

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THANK YOU



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