

COGNITION IN ACTION

LECTURE NINE: DRUGS AND COGNITION

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EFFECTS OF DRUGS ON COGNITION

- Need to consider:
 - Legal drugs (e.g., caffeine & alcohol)
 - Prescription medication
 - Illegal drugs (e.g., ecstasy)
- Need to consider whether drugs influence cognition as a whole or specific cognitive functions differently:
 - E.g., perception, attention, decision making, memory

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EFFECTS OF DRUGS ON COGNITION

- Importance of understanding effects of drugs on cognition is because cognitive functions are central to our survival in the world.
 - Thus, anything that may interfere/disrupt these processes should be known and examined.
- If one (or more) function is not performed in the correct way or the correct time, it could result in fatal consequences
- There are a number of ways to examine cognitive performance
 - Depends if the task is visual, involves recollection, etc.

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EFFECTS OF DRUGS ON COGNITION

- Takagi et al. (2014): investigated effects of inhalants and cannabis on cognition.
 - Participants aged 13 to 24 in three groups based on self-reported history of drug use: inhalant (spray paint), cannabis, and non-substance using control group.
 - Go/No Go test and Stroop test were main task measures.
 - Inhalant users performed worse than controls - less success in discriminating between a "Go" and a "No Go" signal.
 - Also heavy, regular use of inhalants was associated with more incorrect responses on the task.
 - Inhalant users were also less successful in the Stroop task than controls.
 - Conclusion: regular, heavy inhalant use is associated with greater difficulty in decision-making processes.
- However, drug-using participants reported using other drugs, not focused on in the study.

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COCAINE AND COGNITION

- Research shows cocaine users show broad cognitive impairments, including:
 - Basic cognitive functions, such as attention and working memory
 - Complex abilities such as executive functions, social cognition, and social decision-making
- Vonmoos et al. (2013): 30% of dependent and 12% of recreational users displayed clinically relevant global cognitive impairment
 - While dependent users showed the strongest deficits in working memory and executive functions, recreational users displayed the strongest effect sizes in attention and memory functions

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COCAINE AND COGNITION

- Kexel et al. (2020): examined how cocaine users using cocaine for cognitive or social enhancement differ from stimulant-naïve controls and cocaine users that do not have these motives.
 - They assumed cocaine users with an enhancement motive self-medicate deficits in specific cognitive abilities, i.e., they use cocaine to enhance their performance in either social (social motive) or non-social cognitive situations (cognitive motive).
- Forty-two cocaine users were categorized according to motives for cocaine consumption into social and non-social motive groups as well as cognitive and non-cognitive motive groups, respectively.
- The cocaine user motive groups were compared to 48 stimulant-naïve controls in their social and non-social cognitive functioning applying a comprehensive neuropsychological test battery.
- The social motive group showed deficits in cognitive empathy compared to controls and the non-social motive group.

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COCAINE AND COGNITION

- Kexel et al. (2020): No effects were found for emotional empathy and Theory-of-Mind.
- Cognitive and non-cognitive motive groups showed general cognitive deficits but with different patterns of impairments:
 - The cognitive motive group had deficits in working and declarative memory, whereas the non-cognitive motive group also had deficits in working memory but additionally in executive functions.
 - For the domains of declarative memory and executive functions, the respective other cocaine user group displayed intermediate performance.
- This study demonstrates that cocaine is partially instrumentalised by cocaine user with specific enhancement motives to counteract related cognitive impairments.

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REAL-WORLD APPLICATION

- Driving:
 - Drugs commonly associated with impaired driving:
 - Cannabinoids (marijuana)
 - Depressants: hypnotics, sedatives, antihistamine
 - Stimulants: cocaine, meth
 - Narcotic analgesics: morphine, codeine

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REAL-WORLD APPLICATION

■ Effects of Drugs on Driving:

Reaction time Insufficient response	Judgement Risk reduction, avoidance of potential hazards, anticipation, risk-taking behaviour, inattention, decreased fear, exhilaration, loss of control	Tracking Staying in lane, maintaining suitable distance
Perception 90% of info is visual, glare resistance, recovery, dark/light adaptation, dynamic visual acuity	Coordination Effects on nerves/muscles: steering, breaking, accelerating	Attention Divided, not focused, time-shared task with high demand and info processing

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REAL-WORLD APPLICATION

■ Effects of Drugs on Driving:

Cannabis

Slows reactions, affects concentration and reduces ability to steer

Cocaine

Causes erratic behaviour, reduces concentration, can lead to sleepiness after initial resistance to tiredness

Ecstasy

Causes adrenaline surge giving driver feeling of over-confidence

LSD

Vehicle speeds and movement are difficult to judge, causes hallucinations, results in confusion

Heroin

Slows reaction, blurs vision, makes driver feel drowsy/confused

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THEORETICAL CONSIDERATIONS

- Resource theory (Kahneman, 1973) suggests we have a limited “pool” of cognitive resource available when focusing attention
- The more difficult the task, the more attention is focused onto it and thus more of this pool of resources is used.
- If there are > two tasks requiring attention greater than the capacity of attentional resources then allocation can only be made to one.



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THEORETICAL CONSIDERATIONS

- If the tasks combined do not exceed this capacity, as in driving (e.g., attention required to move the car, ensure road ahead is clear of hazards, read signs/traffic signals) then the resources can be shared.
- However, if any cognitive functions have been affected by drug use (as noted in Takagi et al's. study mentioned previously) then more of these resources are needed to perform this cognitive function.
- Therefore, performance in another cognitive task may be significantly reduced, potentially causing an accident.
- Critique: Resource theory cannot offer explanations as to what these resources are referring.

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RESEARCH IN PRACTICAL SETTINGS

- SDT in driving:
 - Relates to the identification of sudden hazards
 - Considers external and internal influences of the driver
- Drugs affect signal detection: both ability of sensory information to be registered and cognitive aspects of decision making.
- However, there are difficulties in examining the effects of drugs and alcohol on driving in real-world settings.
 - Ethics!

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RESEARCH IN PRACTICAL SETTINGS

- Li et al. (2016): investigated the effects of alcohol on driving performance in a simulator.
- Fifty two participants took part in a double-blind test divided into two groups, alcohol and no-alcohol (placebo).
- Results: the higher the levels of alcohol in the bloodstream, the longer participants took to react to brake to avoid a hazard.
- However, the study lacks ecological validity and issues with familiarity of the simulator layout added to the critique.



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RESEARCH IN PRACTICAL SETTINGS

- Using familiar vs. unfamiliar settings on assessing braking response can be explained using SDT.
 - SDT suggests that in an unfamiliar situation we may be more liberal with an affirmative response (braking), because we are paying more attention than normally if the environment is familiar, meaning a faster braking response.
 - Conversely, the different environment may reduce braking response time if the driver is distracted by the surroundings.
 - Both situations may have resulted in unreliable results from a study that was only intending to investigate the effects of alcohol consumption.

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RESEARCH IN PRACTICAL SETTINGS

- How can empirical research examine the effects of drugs in real-world settings in an ethical manner?
 - E.g., Ford have developed a drug driving suit, which simulates the effects of drugs on driving:
 - Although cognition itself is not the focus, physical aspects that influence cognition are captured:
 - Visual impairment glasses to interfere with perception
 - Arm and leg weights to reduce reaction times
 - Headphones playing random sounds to cause confusion

Link to Ford's Drug driving suit video: <https://www.youtube.com/watch?v=UriQNCIS83E>

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IN CONCLUSION

- Drug and alcohol consumption does appear to impact cognitive processing.
 - However, different types of drugs may influence different aspects of cognition differently.
 - The design and tasks employed within research must be considered.
 - The participants who are recruited and manner of recruitment to such studies need to be considered for an array of reasons.
 - Individual differences
 - Differences between short and long term effects require further investigation
 - Research into the effects of drugs and cognition are impacted by the current landscape of drugs in use.

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