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Stimulant Users are Sensitive to the Stimulant Properties of Alcohol as Indexed by Alcohol-Induced Heart Rate Increase

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Abstract

• Aims: One indicator of increased sensitivity to alcohol-induced reward is a heightened heart rate (HR) increase following alcohol intoxication, a characteristic that has been associated with increased alcohol-induced DA release. The goal of this study is to determine whether users of drugs known to induce DA release have higher HR increases after alcohol intoxication than non-users.

Methods: 64 male individuals with known drug-use histories participated in an alcohol challenge. Results: Stimulant users had significantly higher ethanol-induced HR increases, while use of marijuana or hallucinogens was not associated with high HR response to alcohol.

Discussion: In addition to indicating risk for alcohol abuse, high HR response to alcohol may also suggest increased propensity for psychostimulant use.
Introduction

- Stimulants and ethanol are the most frequently co-abused drugs.
- These substances have been demonstrated to induce dopamine (DA) release, a neurotransmitter involved in reward and reinforcement.
- Certain individuals may have increased sensitivity for DA-enhancing drugs.
An exaggerated heart rate (HR) increase following alcohol intoxication has been suggested as a marker of sensitivity to alcohol-induced reward.

This marker has been associated with DA release following alcohol intake and high sensitivity to reward.
Goals and hypotheses of the study

- Investigate the relationship between drug use and HR response to alcohol.
- Our hypothesis is that stimulant users will have elevated HR increases following alcohol intoxication relative to non-stimulant users.
Methods

• 64 males ($M = 22.46$, $SD = 3.39$) received .75 g of pure ethanol per kg of body weight.

• HR was measured at baseline and 30 minutes post-intoxication.

• Drug use behavior was assessed using the Addiction Severity Index and included cannabis, cocaine, amphetamines, hallucinogens, heroin, PCP and inhalant use.
Results

• Heroin, PCP, and Inhalants were used by a very small portion of the sample and hence were not included in the analyses involving HR response.

• Stimulant users had significantly increased cardiac reactivity to alcohol than non-stimulant users (p = .03).
HR Reactivity to Alcohol Intoxication in Stimulant and Non-Stimulant Users

![Bar graph showing HR Reactivity](image)
Results (continued)

• In order to determine the size of the relationship between HR response and stimulant use, an odd ratio was calculated. The probability of having used stimulants increases by 19% as the HR response increases by one bpm.

• On the other hand, cannabis \( (p = .746) \) and hallucinogen \( (p = .273) \) use are not significantly associated with HR response.
Discussion

• Only stimulant use was associated with HR reactivity to alcohol.
• Alcohol/stimulants increase DA levels.
• Sensitization is the potentiation of the effects of one drug following its frequent use.
• Sensitization to the cardiovascular effects of cocaine (Kollins and Rush, 2002) and ethanol (Newlin and Thomson, 1991) have been reported.
Discussion (continued)

• Sensitization is also associated with increased DA availability.
• High HR response to alcohol intoxication may reflect sensitization to alcohol.
• Those who have sensitized to the cardiovascular effects of alcohol may be more sensitive to other DA-enhancing drugs such as stimulants.
This study suggests that stimulant users are sensitive to the stimulant properties of alcohol.

High HR response to alcohol may not only reflect sensitivity to alcohol reward but to all DA-enhancing drugs.

Alcohol and stimulant co-abusers may show superior treatment response to treatments involving DA-mediated medications.