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Creativity on tap? Effects of alcohol intoxication on creative cognition

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ABSTRACT

Anecdotal reports link alcohol intoxication to creativity, while cognitive research highlights the crucial role of cognitive control for creative thought. This study examined the effects of mild alcohol intoxication on creative cognition in a placebo-controlled design. Participants completed executive and creative cognition tasks before and after consuming either alcoholic beer (BAC of 0.03) or non-alcoholic beer (placebo). Alcohol impaired executive control, but improved performance in the Remote Associates Test, and did not affect divergent thinking ability. The findings indicate that certain aspects of creative cognition benefit from mild attenuations of cognitive control, and contribute to the growing evidence that higher cognitive control is not always associated with better cognitive performance.

1. Introduction

Can alcohol consumption support creative thought by inducing disinhibition, or will it just impair cognitive control and similarly affect creative cognition? The idea about a positive relationship between alcohol and creativity has been popularized by reports associating eminent creativity with excessive alcohol consumption (Knafo, 2008). But empirical evidence is sparse, and the association between alcohol and creativity seems at odds with the relevance of cognitive control for creative thought (e.g., Benedek, Jauk, Sommer, Arendasy, & Neubauer, 2014). Therefore, this study examined the effect of alcohol on executive control and on standard measures of creative cognition.

Creative cognition is assumed to rely on both controlled, goal-directed and spontaneous, undirected cognitive processes (Beaty, Silvia, Nusbaum, Jauk, & Benedek, 2014; Benedek & Jauk, in press; Sowden, Pringle, & Gabora, 2015). Pertinent research mostly focused on divergent thinking (viz. creative idea generation) and creative problem solving (i.e., problems that can be solved either analytically or insightfully, which typically implies a restructuring of the problem representation). The relevance of cognitive control for divergent thinking is evidenced by consistent correlations with intelligence (Kim, 2005; Silvia, 2015), particularly with fluid intelligence (Jauk, Benedek, Dunst, & Neubauer, 2013; Nusbaum & Silvia, 2011) and broad retrieval ability (Avitia & Kaufman, 2014; Benedek, Franz, Heene, & Neubauer, 2012; Silvia, Beaty, & Nusbaum, 2013). At the level of executive abilities, divergent thinking has been associated with working memory capacity and cognitive inhibition (Benedek et al., 2012, 2014; De Dreu, Nijstad, Bass, Wolsink, & Roskes, 2012; Zabelina, Robinson, Council, & Bresin, 2012). Divergent thinking requires overcoming prepotent, uncreative response tendencies and involves cognitive strategies (Gilhooly, Fioratou, Anthony, & Wynn, 2007), which was shown to be facilitated by intelligence (Beaty & Silvia, 2012; Nusbaum & Silvia, 2011; Nusbaum, Silvia, & Beaty, 2014). While much of the empirical evidence on creative cognition and cognitive control is based on divergent thinking, similar evidence also exists for creative problem solving. Creative problem solving tasks like Duncker's candle problem or the Remote Associates Test can be achieved in a

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strategic way (Fleck & Weisberg, 2004; Smith, Huber, & Vul, 2013), and higher performance again has been related to intelligence and executive control (Gilhooly & Fioratou, 2009; Lee, Huggins, & Therriault, 2014).

Creativity has also been associated with disinhibition and spontaneous insight (Eysenck, 1995; Kounios & Beeman, 2014). Empirical evidence for the relevance of spontaneous, undirected cognitive processes in creative thought mostly comes from research on incubation processes. Creative problem solving sometimes leads to an impasse of thought, also known as *mental fixation*, were goal-directed solving attempts are no longer fruitful. Incubation research has demonstrated that breaks from deliberate problem solving can benefit creativity by refreshing inadequate mindsets while leaving room for unconscious work (Hélie & Sun, 2010; Sio & Ormerod, 2009). Similarly, while expertise typically supports problem solving by guiding search through problem space, it can also be detrimental when misdirecting search efforts to salient but inadequate concepts (Wiley, 1998). Together, these findings suggest that cognitive control generally supports creative cognition by facilitating the effective implementation of goal-directed processes, but focused attention may sometimes be ineffective and potentially even harm creative problem solving (Wiley & Jarosz, 2012).

The role of cognitive control in creative cognition has also been addressed by experimental studies examining the effects of low to moderate doses of alcohol (i.e., usually inducing a blood alcohol concentration < 0.08) on different measures of creative ability. One study reported that the fluency of idea generation was reduced in both an alcohol group and a placebo group compared to the control group (Gustafson, 1991). Another investigation found that intoxicated writers and non-writers showed reduced idea flexibility but an increased number of non-obvious, original ideas (Norlander & Gustafson, 1998). Yet another study observed no notable effects of alcohol on divergent thinking performance, but participants evaluated their performance as more creative when they thought that they had received alcohol (Lang, Verret, & Watt, 1984). A more recent study demonstrated that moderate alcohol intoxication impaired working memory performance, but the intoxicated group showed higher performance in the Remote Associates Test (RAT) compared to a control group not receiving any drinks (Jarosz, Colflesh, & Wiley, 2012).

Together, the available research provides partial support for a positive effect of alcohol on creative cognition, but evidence is still sparse and inconsistent. Part of the inconsistency might be attributed to missing placebo control groups, and the focus on single measures of creative potential. People tend to overestimate their creative performance and even become more creative when they think they have consumed alcohol, which points to the importance to include placebo control groups in order to dissociate pharmacological effects from expectation effects (Lang et al., 1984; Lapp, Collins, & Izzo, 1994). Moreover, findings may be specific to certain aspects of creative cognition such as insight problem solving and divergent thinking, and even the scoring of divergent thinking tasks can be an issue when focusing on summative uniqueness, which is known to be severely confounded with response fluency (Silvia et al., 2008). The present study thus tested the effects of mild alcohol intoxication in a placebo-controlled design using alcoholic and non-alcoholic beer. We examined the effects of alcohol on objective and subjective levels of intoxication, executive control, and two standard tasks of creative potential: creative problem solving in the Remote Associates Task and divergent thinking ability, scored for rated creativity, fluency, flexibility and novelty. Reduced cognitive control via mild alcohol intoxication could be expected to attenuate fixation effects (Smith & Blankenship, 1991) and thus support cognitive flexibility in the Remote Associates Test (Jarosz et al., 2012). The available research allows no clear prediction regarding the effect of alcohol on divergent thinking ability (Gustafson, 1991; Norlander & Gustafson, 1998). On the one hand, divergent thinking is known to involve executive processes similar to intelligence tasks (Benedek et al., 2014; Silvia, 2015). On the other hand, lower cognitive control might increase disinhibition and unusualness of thought (e.g., Babor, Berglas, Mendelson, Ellingboe, & Miller, 1982; Eysenck, 1995; Field, Wiers, Christiansen, Fillmore, & Verster, 2010), and thereby support the exploration of new and unusual parts of the idea space in the given problem (as measured by fluency, flexibility and novelty). Together, these mechanisms might facilitate the generation of unusual and potentially even creative ideas.

2. Material and methods

2.1. Participants

132 people participated in an online screening, which aimed to identify those eligible for participation in the main study. The online screening asked about age, potential pregnancy, heart or liver diseases, psychiatric disorders, and included the Alcohol use disorders identification test (AUDIT; Saunders, Aasland, Babor, De la Fuente, & Grant, 1993). 89 people from the screening met all criteria for participation, as they were at least 18 years old (the local age limit for legal consumptions of any type of alcoholic drinks), reported no pregnancy or relevant disease, and were casual drinkers of alcohol but with an AUDIT level < 8 reflecting no risk for alcohol-related problems. A total of 70 young adults (54 % female), aged between 19 and 32 years ($M = 23.3$; $SD = 2.8$), finally participated and completed all measures.

2.2. Experimental design and procedure

This study investigated the effect of alcohol on cognition in a randomized placebo-controlled pretest-posttest design. We used beer as experimental intervention, because it is available in alcoholic and non-alcoholic form and represents a highly popular drink among male and female University students. Participants of the alcohol group received *Gösser Zwickl*® (5.2% alcohol by volume) and participants of the non-alcoholic group received *Gösser Naturgold*® ($< 0.5\%$ alcohol by volume). These two beers were selected because they are very similar in taste and visual appearance (i.e., golden, naturally cloudy). The amount of beer was individually adjusted for weight, age and gender (Watson, Watson, & Batt, 1980; Widmark, 1932) targeting at a blood alcohol concentration (BAC) of 0.03 (in