



Short communication

## Which facets of impulsivity predict binge drinking?

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## ARTICLE INFO

## Article history:

Received 8 December 2015

Received in revised form 7 March 2016

Accepted 7 March 2016

Available online 8 March 2016

## Keywords:

Binge drinking

Alcohol

Impulsivity

Risk factors

Urgency

Sensation seeking

## ABSTRACT

**Background:** Impulsive binge drinking is a serious public health issue, and to reveal predisposing factors to this consumption pattern is, therefore, required. Impulsivity-related traits are important predictors of alcohol use and abuse. Nonetheless, previous research in binge drinking has been confounded by various definitions and cut-off scores, implying that existing studies contributed to limited comprehension on the specific role of different impulsivity facets. The current study thus disentangles the role of impulsivity facets in binge drinking by adopting a dimensional approach, considering the condition on a continuum, to avoid relying on debatable and non-definitive criteria.

**Methods:** 162 students underwent assessment of alcohol consumption, including drinking patterns and impulsive traits, as captured in the UPPS-P framework (i.e., negative urgency, positive urgency, sensation seeking, lack of perseverance, lack of premeditation). Multiple regression analyses were utilized in order to investigate the predictive role of each impulsivity facet in binge drinking.

**Results:** Binge drinking was associated with sensation seeking. However, when statistically controlling for gender, age and global alcohol consumption, this effect disappeared, and negative urgency remained the only impulsivity component that significantly predicted binge drinking.

**Conclusion:** We found the severity of binge drinking to be associated with negative urgency, suggesting that the binge drinking pattern is displayed in reaction to negative emotional states, and can be conceptualized as a maladaptive and short-term emotional coping. The study calls for prevention and treatment interventions designed to improve self-control, and more adaptive emotion regulation strategies.

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### 1. Introduction

Binge drinking refers to the tendency to drink large amounts of alcohol within a short period of time, leading to high levels of inebriation, and thereafter, periods of abstinence (Courtney & Polich, 2010). Drinking pattern is common in young adults, with prevalence ranging from 19.6% to 72% depending on definition and population (Balodis, Potenza, & Olmstead, 2009; Plant, Plant, Miller, Gmel, & Kuntsche, 2009). Males are more often binge drinkers than females (Wechsler, Davenport, Dowdall, Moeykens, & Castillo, 1994).

A construct often associated with binge drinking is impulsivity (e.g. Stautz & Cooper, 2013; Whelan et al., 2014), a term representing a failure to resist an impulse or urge that exerts disproportionate influence on behavior, despite harmful consequences to oneself or others (Cherkasky & Hollander, 1997). Despite binge drinking being reported as motivated by social reasons and to enhance mood (Kuntsche,

Knibbe, Gmel, & Engels, 2005), it can be, under certain circumstances, associated to severe negative outcomes, in both the public and individual domains (Plant et al., 2009). Due to the high prevalence of binge drinking, in combination with its severe negative consequences, it is important to identify the risk factors influencing its onset and maintenance.

Impulsivity is an umbrella construct that has to be disentangled into lower order traits or facets (Evdenden, 1999; Whiteside & Lynam, 2001). A recognized multi-dimensional approach of impulsivity is provided by the UPPS-P Impulsive Behavior Scale (Lynam, Smith, Cyders, Fischer, & Whiteside, 2007), which distinguishes five distinct impulsivity facets: negative urgency (i.e., the tendency to act rashly when experiencing intense negative affects), positive urgency (i.e., the tendency to act rashly when experiencing intense positive affects), sensation seeking (i.e., the tendency to enjoy and pursue activities that are exciting, and openness to new experiences), lack of premeditation (i.e., the tendency to fail to think and reflect on the consequences of an act before engaging in that act), and lack of perseverance (i.e., difficulties remaining focused on a task that may be long, boring, or difficult). The UPPS-P constructs were shown to have high internal consistency, and numerous studies have supported the factorial structure and construct validity of the

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five impulsivity facets measured (Billieux et al., 2012; Cyders et al., 2007; Whiteside, Lynam, Miller, & Reynolds, 2005).

Different facets of UPPS-P have previously been associated with substance use and abuse, including alcohol and illicit drugs (Whiteside & Lynam, 2003). Alcohol abuse and binge drinking are considered part of a continuum (Bonomo, Bowes, Coffey, Carlin, & Patton, 2004) and it is, therefore, worth endeavoring to clarify the exact facets attributable to binge drinking in order to prevent transition to more serious forms of alcohol related problems. A recent meta-analytic review (Coskunpinar, Dir, & Cyders, 2013) reported associations between binge drinking and four of the facets of the UPPS-P derived from a manifold of different questionnaires with conceptually overlapping contents. Binge drinking was associated with sensation seeking by medium effect size, lack of premeditation, and lack of perseverance with medium-to-small effect sizes, and negative urgency with small effect size only. Later, Banca et al. (2016) reported higher levels of positive urgency in binge drinkers compared to healthy volunteers.

The field of binge drinking is hampered by several different definitions, and the scientific community has not reached unanimity over what constitutes binge drinking (Glassman, 2010). Thus, knowledge based on different cut scores for assigning group affiliation as the 4/5 units within 2 h definition provided by NIAAA (2004) or various splits of the binge score (e.g. Townshend & Duka, 2002, 2005) are useless when the cut score changes. The different definitions also assume a qualitative change associated to some arbitrary cut scores, overlooking the dimensionality of the phenomenon (e.g. Enoch, 2006). Alongside are concerns that the number of alcohol units consumed is associated to widely different levels of intoxication, depending on body composition, metabolism, and genetic makeup. Most previous studies have also failed to account for the difference between heavy drinking and drinking pattern by omitting a specified time frame for consumption, thereby mixing the two together.

In order to separate drinking pattern from global alcohol consumption, based on an individual measure of intoxication, we argue in favor of the binge score. This measure embraces individual variance in inebriation, along with a continuous approach to estimate the predictive role of impulsivity facets in binge drinking.

## 2. Materials and methods

### 2.1. Participants

266 persons self-enrolled in the study by responding to advertisements at the campus of the University of Oslo and ads in social media asking them to participate in a study of alcohol habits. However, some did not meet the inclusion criteria, while others were excluded based on exclusion criteria, as described in Bø, Aker, Billieux, and Landrø (2015), and some withdrew prior to the session at the Department of Psychology. Thus, the results presented here are based on 162 students, aged 18 to 25, who self-reported to drinking alcohol regularly (alcohol use disorder identification test; AUDIT  $\geq 1$ ), and to be healthy in terms of somatic, neurologic and serious psychiatric illnesses, with limited use of other substances.

### 2.2. Questionnaires

Participants completed the AUDIT (Saunders, Aasland, Babor, De la Fuente, & Grant, 1993) to assess harmful alcohol consumption during the last year, and they self-reported weekly alcohol consumption in units (in Norway, one unit of alcohol is 12.8 g). The last three questions of the Alcohol Use Questionnaire [10: Number of drinks per hour; 11: Number of times intoxicated by alcohol; 12: Percentage of time drunk when going out drinking] (Mehrabian & Russell, 1978) were used to calculate the binge score (Townshend & Duka, 2002).

The multi-faceted construct of impulsivity was assessed by the short French version of the UPPS-P Impulsive Behavior Scale (Billieux et al., 2012), which is a time-saving adaptation of the five factor UPPS-P developed by Lynam et al. (2007). The original English items of the questionnaire (Cyders et al., 2007; Whiteside & Lynam, 2001) were translated into Norwegian by author RB and translated back into English by a bilingual person with English as a native language. Discrepancies between the back-translated and the original English versions were discussed, and translation adjustments were consensually made. Cronbach's Alpha was 0.67 for positive urgency, 0.77 for negative urgency, 0.74 for sensation seeking, 0.81 for lack of premeditation, and 0.86 for lack of perseverance, respectively.

The alcohol questionnaires were completed online, and the UPPS-P at the Department of Psychology at the University of Oslo, along with other measures which are not related to the current study, and are presented elsewhere (Bø et al., 2015).

### 2.3. Statistical analysis

All statistical analyses were performed in IBM SPSS 22.

Six participants had missing data on one item each. The missing values were replaced with the mean of that particular item. Independent sample t-tests were used to investigate differences among gender on sample characteristics. The binge score, weekly alcohol consumption and AUDIT were logarithmically transformed due to skewed distributions.

Two multiple linear regression analyses were performed to predict binge drinking. Thus, the binge score was entered as the dependent variable. The UPPS-P facets were entered as independent predictor variables in both models. In the second model, gender, age and weekly alcohol consumption were simultaneously added as covariates. Weekly alcohol consumption was added in order to separate drinking pattern from the amount of alcohol consumed, and gender to statistically control for higher binge scores in males. Age was added due to the impact on impulsivity traits (Steinberg et al., 2008). No multi-collinearity between the independent predictors entered the prediction regarding both regression analyses computed, as reflected by a variance inflation factor over 2.5, and a tolerance score below .40 (Allison, 1999). Residuals were investigated with the Shapiro-Wilk's test to ensure that parametric assumptions were met. Alpha was set at .05 for all analyses.

## 3. Results

Table 1 shows the characteristics of the participants.

The binge score was significantly correlated with gender ( $r = -.215$ ,  $p = .004$ ), weekly number of alcohol units ( $r = .505$ ,  $p < .001$ ), and AUDIT ( $r = .732$ ,  $p < .001$ ), but not age ( $r = -.042$ ,  $p = .595$ ). Due to the high correlation between number of alcohol units per week and AUDIT ( $r = .643$ ,  $p < .001$ ), only the first was included as covariate to avoid multicollinearity-related problems, along with gender.

### 3.1. Multiple linear regression models

Data from one male subject was removed due to residuals deviating 3 SD from the mean in both models.

The first regression analysis considered the UPPS-P facets as predictors of the binge score. The model was significant, with sensation seeking as the only significant predictor. Cohen's  $d = .3$ , indicating small-to-medium effect size. See Table 2 for details.

In the second regression analysis, the binge score was still the dependent variable, and the UPPS-P facets the independent predictors. Simultaneously, we added gender, age and weekly alcohol consumption as covariates. The model was significant. Weekly alcohol consumption and negative urgency were significant predictors of the binge score.

**Table 1**  
Descriptives of the study sample.

	Total		Males		Females		
	M	SD	M	SD	M	SD	
N	162		80		82		
AUDIT	10	5.7	10.9	5.4	9.2	5.9	$t(160) = 1.683, p = .055$
Binge score	25.6	17.7	29.7*	15.8	21.7	18.5	$t(160) = 2.915, p = .004$
Mean number of alcohol units <sup>a</sup> per week	6.6	6.9	8.1*	7.5	5.1	5.9	$t(160) = 3.469, p = .001$
UPPS-P positive urgency	9.3	2.4	9.3	2.6	9.4	2.3	$t(160) = -.188, p = .851$
UPPS-P negative urgency	8.6	2.6	8.2	2.5	8.9	2.7	$t(160) = -1.799, p = .074$
UPPS-P sensation seeking	10.9	2.6	11.7*	2.1	10.2	2.8	$t(160) = 3.469, p = .001$
UPPS-P lack of perseverance	7.0	2.5	7.3	2.5	6.7	2.5	$t(160) = .288, p = .733$
UPPS-P lack of premeditation	7.5	2.5	7.4	2.5	7.5	2.5	$t(160) = -.143, p = .877$

Note. M = mean. SD = standard deviation. Binge score, AUDIT, and mean number of alcohol units per week were logarithmically transformed.

<sup>a</sup> 1 unit of alcohol = 12.8 g of alcohol.

\*  $p < .05$  significant difference between males and females.

Cohen's  $d = 1.1$  and  $.4$ , indicating large and medium effect size, respectively. See Table 3 for details.

Fig. 1 depicts the relation between the binge score and the UPPS-P Negative urgency scores.

**4. Discussion**

This study emphasized that impulsivity traits differentially predict binge drinking, irrespective of whether or not demographic and actual consumption is controlled for. Although previous studies found binge drinking to be predicted by high sensation seeking, the current study failed to highlight such an association when statistically controlling for the effects of age, gender, and global alcohol consumption. In contrast, only negative urgency turns up as the alleageable facet candidate.

Sensation seeking-related behaviors (e.g., risky sports, substance use) are more frequently reported by males (Cross, Cyrenne, & Brown, 2013), as in our sample, and it is, therefore, not surprising that this facet loses its predictive value when the variance attributable to gender is removed. Also, males consume more alcohol than females, and removal of variance attributable to global alcohol consumption, therefore, provides a more “clear cut” measure of binge drinking. This corresponds to the idea that binge drinking, at least partly, can be independent from the global amount of alcohol consumed (Townshend & Duka, 2002). Thus, sensation seeking is probably related to heavy drinking and the male gender rather than the binge drinking pattern *per se*.

Impulsive alcohol consumption, as binge drinking, has been theorized as an attempt at regulating negative emotions, albeit not without associated risks (Tice, Bratslavsky, & Baumeister, 2001). In other words, binge drinking could be conceptualized as a short-term coping strategy devoted to relieving negative affective states, like other maladaptive behaviors such as binge eating or compulsive buying (Billieux, Rochat, Rebetez, & Van der Linden, 2008; Selby, Anestis, & Joiner, 2008). Importantly, our finding that negative urgency specifically predicts binge

drinking is in line with the “emotion regulation” hypothesis of binge drinking. Since binge drinking severity is associated to negative urgency, it might indicate that binge drinking serves to regulate or alleviate negative affect or aversive emotional states. Prospective studies of emotion and emotion regulation during binge drinking episodes could verify this hypothesis. Indeed, several previous studies have related negative urgency traits to a wide range of behaviors displayed to regulate negative affect in the short run, without considering its long term consequences (Anestis, Selby, & Joiner, 2007; Cyders & Smith, 2008). Based on previous evidence that the urgency trait is associated to specific self-control-related mechanisms (e.g. prepotent response inhibition) and maladaptive emotion regulation strategies (d’Acromont & Van der Linden, 2007; Gay, Rochat, Billieux, d’Acromont, & Van der Linden, 2008), prevention and treatment interventions targeting binge drinking should be designed to promote self-control and more adaptive emotion regulation strategies.

On the whole, our findings are in line with previous studies, having shown that while the frequency and quantity of drinking are predicted by sensation seeking, negative consequences associated with these behaviors (i.e., impact on daily life) are rather predicted by negative urgency (Smith, Fischer, Cyders, Annus, & Spillane, 2007). Thus, the fact that binge drinking has previously been associated to negative urgency by small effect sizes only, might be due to the mix of drinking patterns and heavy consumption when operationalizing the phenomenon.

Since the current study is cross-sectional, it provides a snapshot of the present association between impulsive behaviors and binge drinking; however, the design is limited in estimating causality. The study was conducted in a sample of healthy students, and future studies should investigate the role of the UPPS-P in broader, more representative samples, preferably in a prospective or longitudinal design. Also, a

**Table 2**  
Multiple linear regression with binge score as dependent variable.

	B	S.E.	t	β	p	sr <sup>2</sup>
UPPS-P negative urgency	.028	.027	1.045	.106	.298	.01
UPPS-P positive urgency	-.003	.031	-.112	-.012	.911	<.01
UPPS-P sensation seeking	.049	.023	2.165	.175	.032*	.03
UPPS-P lack of perseverance	-.004	.024	-.155	-.014	.877	<.01
UPPS-P lack of premeditation	.034	.025	1.346	.127	.180	.01
F (5, 155)	2.328					
p	.045*					
R <sup>2</sup>	.070					
adj. R <sup>2</sup>	.040					

Note. sr<sup>2</sup> is the squared semi-partial correlation. Logarithmically transformed values for binge score.

\*  $p < .05$ .

**Table 3**  
Multiple linear regression with binge score as dependent variable.

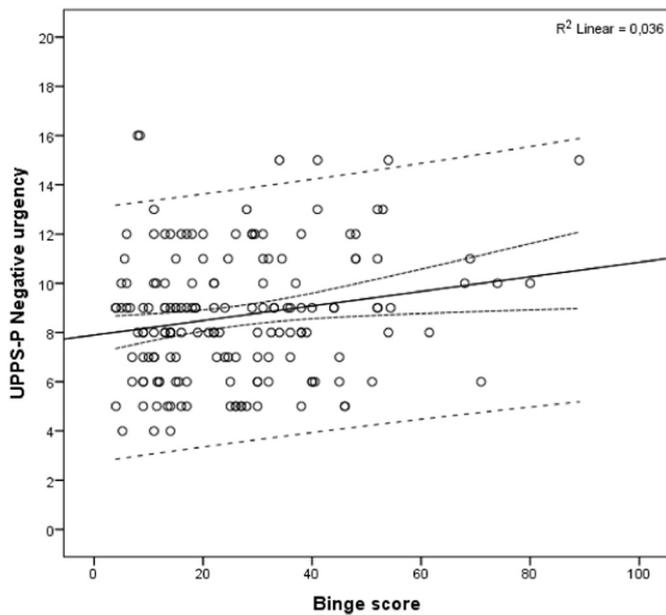
Variables	B	S.E.	t	β	p	sr <sup>2</sup>
Gender	-.120	.102	-1.171	-.087	.244	.01
Age	-.043	.024	-1.798	-.125	.074	.01
Alcohol (units <sup>a</sup> /week)	.393	.056	7.003	.499	<.001**	.22
UPPS-P negative urgency	.047	.023	2.003	.180	.044*	.02
UPPS-P positive urgency	-.031	.027	-1.139	-.106	.257	.01
UPPS-P sensation seeking	.037	0.21	1.790	1.179	.075	.01
UPPS-P lack of perseverance	-.013	.021	-.616	-.048	.539	<.01
UPPS-P lack of premeditation	.026	.022	1.193	.097	.235	<.01
F (8, 152)	9.141					
p	<.001**					
R <sup>2</sup>	.325					
adj. R <sup>2</sup>	.289					

Note. sr<sup>2</sup> is the squared semi-partial correlation. Logarithmically transformed values for the binge score and alcohol (units/week).

<sup>a</sup> 12.8 g of alcohol.

\*  $p < .05$ .

\*\*  $p < .001$ .



**Fig. 1.** Relation between the binge score and the UPPS-P Negative urgency. For illustration purposes, the raw data rather than the transformed data are provided. The solid line represents prediction line, the dotted lines represent confidence intervals of the mean, and the dashed lines represent the 95% confidence interval.

simultaneous investigation of how impulsivity *in interaction* with drinking motives causes binge drinking is required in order for a more complete understanding of the phenomenon (e.g. Jones, Chryssanthakis, & Groom, 2014).

## 5. Conclusion

Severity of binge drinking is associated with negative urgency, supporting the emotion regulating properties of the drinking pattern. To prevent binge drinking, treatment and prevention interventions should therefore promote self-control and more adaptive emotion regulation strategies.

## Role of funding sources

Funding for this study was provided by the Department of Psychology at University of Oslo. The Department had no role in the study design, collection, analysis or interpretation of the data, writing the manuscript, or the decision to submit the paper for publication.

## Contributors

All authors designed the study, and RB wrote the protocol. Authors RB and JB conducted literature searches and provided summaries of previous research studies. Author RB conducted the statistical analysis. Author RB wrote the first draft of the manuscript and all authors contributed to and have approved the final manuscript.

## Conflict of interest

All authors declare no conflicts of interest.

## Acknowledgments

The authors would like to thank Katherine Remy for translating the short UPPS-P into Norwegian, and Emilie Smith Astrup for contributing to the data collection.

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