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Corrigendum

Corrigendum to "Binging at the campus: motivations and impulsivity influence binge drinking profiles in university students" [Psychiatry Research (2017) 146–154]

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The authors regret that an error has been detected regarding the results reported for the UPPS-P scores, implying some modifications in the description of the binge drinkers' subgroups.

It should be underlined that the main results highlighted in the published study (Lannoy et al., 2017) and its key conclusions have not been modified: the optimal three-cluster solution and all group comparisons described in the original article remain correct. However, we found that the online questionnaire presenting the UPPS-P led to erroneous scores (see Tables 2–4 and Fig. 1 for the corrected scores, Table 1 remaining unchanged). These changes have resulted in some modifications regarding the description of the clusters: Cluster 1 has been renamed *occasional binge drinkers* group (see Figs. 1–2), and is characterized by low levels of premeditation and perseverance; According to their consumption patterns (no changes were related to alcohol consumption), Clusters 2 and 3 have kept their original names, but the UPPS-P-related descriptions have been modified in such a way that Cluster 2, the *recreational binge drinkers group*, is described by high levels of urgency and sensation seeking together with reduced lack of premeditation and perseverance; and Cluster 3, the *hazardous binge drinkers group*, is characterized by all drinking motives and elevated urgency. To offer a better description of these new results, a modified discussion section has also been proposed in this Corrigendum. Importantly, the perspectives and implications described in the original article remain valid, the only previous conclusion to be adapted being related to the fact that the hazardous subgroup of binge drinkers is still mainly associated with drinking motives, but also with a specific facet of impulsivity (i.e. urgency).

This Corrigendum also proposes a slightly modified version of the discussion, including the changes related to the modified results.

Discussion

This study was the first to propose a joint analysis of drinking motives and impulsivity traits in a large sample of binge drinkers by means of a cluster analysis. As the psychological factors underlying the development and maintenance of binge drinking habits are little known, our aims were to explore: (a) whether binge drinking can be associated with specific drinking motives and impulsivity traits, and (b) whether valid subgroups of binge drinkers can be identified, potentially being characterized by a distinct combination of these variables. Results showed three binge drinker subgroups that vary in terms of impulsivity traits and drinking motives, as well as in negative outcomes associated with their drinking habits. In view of these results, the three clusters were named as follows: Cluster 1 regrouped "occasional binge drinkers", Cluster 2 comprised "recreational binge drinkers", and Cluster 3 included "hazardous binge drinkers".

The first subgroup, occasional binge drinkers, has low levels of both premeditation and perseverance. As suggested in past studies, the lack of premeditation and perseverance may be characteristic of the living habits found in university students [e.g., using alcohol consumption as a reward for hard work, as a mean to procrastinate, or when bored (Jasinski and Ford, 2007)]. However, while the lack of premeditation is associated with alcohol consumption and potentially with early binge drinking (Stautz and Cooper, 2013), the lack of perseverance is not directly related to drinking frequency nor intensity (Magid and Colder, 2007). This absence of strong link with alcohol consumption is supported by the comparisons performed with other binge drinker clusters, showing lower drinking motives in this subgroup (see Fig. 1) and suggesting an occasional binge drinking pattern. Indeed, the pattern of alcohol consumption in Custer 1 appears to be the least problematic based on the AUDIT score. Besides, this group is also characterized by unbalanced gender-ratio (63.3% of men). Using the UPPS-P, it has been shown that men tend to report higher sensation seeking (Billieux et al., 2012; Cyders, 2013), positive urgency, and lack of perseverance (Cyders, 2013) than women. While urgency and sensation seeking are more present in Cluster 2, presenting a more balanced gender ratio, our results on Cluster 1 might be in line with a higher lack of perseverance in men.

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Table 2
Comparisons between binge drinker and non-binge drinker groups on impulsivity, drinking motives, and AUDIT.

Variable	Binge drinkers (n = 867) Mean (*SD*)	Non-binge drinkers (n = 924) Mean (*SD*)	*t*	*η2*
Impulsivity				
Urgency	17.94 (4.08)	17.31 (3.74)	3.39**	0.006
Lack of premeditation	9.36 (2.88)	9.67 (3.26)	2.13*	0.003
Lack of perseverance	9.37 (3.33)	9.67 (3.62)	1.80	
Sensation seeking	9.38 (2.68)	8.82 (2.27)	4.79***	0.01
Drinking Motives				
Enhancement	13.50 (4.79)	9.86 (3.84)	17.82***	0.15
Social order	16.06 (3.88)	13.34 (4.04)	14.55***	0.11
Coping	19.08 (6.75)	17.25 (6.04)	6.06***	0.02
Conformity	6.58 (2.60)	6.38 (2.33)	1.71	
AUDIT-Total	14.42 (5.27)	6.76 (4.06)	34.56***	0.40

Note. *p < 0.05. **p < 0.01. ***p < 0.001.

The second subgroup, recreational binge drinkers, represents the majority of the sample. Binge drinkers from this cluster are characterized by heightened impulsivity, as shown by high levels of urgency and sensation seeking, but also by elevated premeditation and perseverance. This impulsivity profile thus reflects affective and motivational-based impulsivity (i.e. act rashly when confronted with intense emotions or to search for strong stimulation and excitement), but preserved abilities to take into account the consequences of actions and to persist in difficult and demanding cognitive tasks. Regarding alcohol consumption, students have a high drinking frequency and often drink more than six units in one occasion, representing the typical binge drinking pattern. However, results indicated no significant difference with Cluster 1 regarding problematic consumption. Moreover, this subgroup reported being less frequently drunk than other groups, therefore suggesting preserved control on alcohol consumption. These binge drinkers thus present a recreational pattern, which can be viewed as a way to enhance or maintain positive affect (Cox et al., 2015) in a context of efficient executive control. Further comparisons also showed that their drinking motives, particularly positive reinforcement motives (enhancement and social order), are elevated in comparison with non-binge drinkers, which emphasizes the critical role of these motives in binge drinking. Indeed, alcohol consumption motivated by pleasure (enhancement motives) or social aspects (social order motives) is representative of this population and was related to drinking frequency and intensity (Kuntsche et al., 2014). In the same vein, sensation seeking is strongly related to binge drinking (Coskunpinar et al., 2013) but appears associated with less problematic consumption (Stautz and Cooper, 2013). In view of these results, it can be hypothesized that, while this group is partially described by high urgency, the members of this cluster still have the abilities needed to regulate their alcohol consumption in later adulthood.

Finally, the third subgroup, hazardous binge drinkers, appears to constitute the more problematic group, as reflected by their higher AUDIT score. Referring to the NIAAA criteria (2004), this cluster is rather composed of heavy drinkers, namely individuals presenting frequent binge drinking (i.e. more than five episodes per month). Moreover, according to the AUDIT cutoffs, it may also be hypothesized that this subgroup encompasses individuals with probable severe alcohol use disorders (i.e. scores higher than 19). Binge drinkers from this cluster are mainly characterized by high scores on all drinking motives, which have been associated to extreme drinking (White et al., 2016), but also elevated urgency, which is known as the best predictor of binge drinking intensity among the impulsivity facets (Bø et al., 2016). Students in this subgroup mainly consume alcohol for conformity and coping purposes, the latter being the strongest predictor of drinking-related problems (Cooper, 1994). Moreover, the combination of urgency and coping motives suggests that this binge drinking can be conceptualized as a (maladaptive) emotion regulation strategy. Such a view is in accordance with previous studies showing that alcohol consumption can be used to increase positive affect but also decrease negative ones (Cox et al., 2015). In this perspective, binge drinking can serve to overcome or reduce negative affect, as previously shown in different patterns of alcohol consumption, notably among undergraduate students (Terlecki and Buckner, 2015). Besides, the possible relationship between impulsivity and enhancement motives should be mentioned, as enhancement may be a mediator between increased alcohol consumption and impulsivity (Loxton et al., 2015). However, this study was based on a unidimensional view of impulsivity and should be confirmed. As a whole, with respect to Cooper's model (1994), both emotion regulation-related motives (coping and enhancement) were associated with drinking problems and when typical levels of alcohol use were controlled, coping remained the most predictive motive related to alcohol problems. In line with previous studies suggesting that binge drinking could be a first stage towards alcohol-related disorders (Sanhueza et al., 2011), this cluster thus appears to group the students who are the most likely to present an alcohol use disorder and to evolve towards severe alcohol-use disorders , particularly in view of their very high scores on the AUDIT items related to negative consequences.

A central aspect of the present results is that the most problematic cluster regarding alcohol consumption is mainly characterized by pronounced drinking motives and high levels of urgency. Indeed, although impulsivity has been shown to be a hallmark of addictions (Coskunpinar et al., 2013), influential models of binge drinking posit that this drinking pattern, which is not necessarily addictive, is more strongly related to important expectancies and motivations towards alcohol (Oei and Morawska, 2004). Our results go further and suggest that impulsivity traits characterize some subgroups of binge drinkers (Clusters 1 and 2) and that only the combination between high drinking motives and high urgency may efficiently capture hazardous binge drinkers. Nevertheless, it is worth noting that the current results were based on self-reported measures of impulsivity. Future studies should specify the role played by impulsivity using experimental measures, as the correlations observed between self-reported and experimental measures of impulsivity traits are generally relatively modest (Cyders and Coskunpinar, 2011). Conversely, concerning drinking motives, studies stated a good consistency between self-reported measures and actual alcohol consumption (Kuntsche and Kuendig, 2012).

As this study was the first to propose subtyping of binge drinking on the basis of psychological factors, the original results obtained here need to be replicated and extended. In this study, impulsivity and drinking motives have been explored because they are widely validated and have been extensively relied to alcohol-related disorders. Future studies should however explore binge drinkers' subgroups by considering a more exhaustive assessment of psychological factors. Studies also have to more comprehensively explore the role of comorbid psychopathology and involved psychological processes (e.g., emotional reactivity, emotional regulation, repetitive negative thinking) to clearly describe the psychological profiles of each subgroup. Moreover, while all the items related to coping motives were kept in the analyses, the two coping subscales (depression and anxiety) were merged to avoid multicollinearity, and the present results should be confirmed by using the original DMQ-R version. It is also worth noting that compared to other motives, the 'coping anxiety' has a lower internal reliability in the current sample (Table 1). Beyond this, the study emphasized that binge drinking is a heterogeneous problematic behavior, which raises important implications. First, at the fundamental level, this study allows a better understanding of binge drinking and the role of psychological factors implicated in this pattern of harmful alcohol consumption. The present results contribute to the specification of Oei and Morawska (2004) model by describing the existence of different binge drinkers' subgroups. They also suggest that problematic consumption in student binge drinkers is related to drinking motives and urgency, thus

Table 3
Comparisons between the three binge drinking clusters.

Variable	Range	Cluster 1 (n = 270; 31.1%) Occasional binge drinkers Mean (*SD*)	Cluster 2 (n = 450; 51.9%) Recreational binge drinkers Mean (*SD*)	Cluster 3 (n = 147; 17%) Hazardous binge drinkers Mean (*SD*)	*F*	C1-C2	C1-C3	C2-C3
Cluster profile								
Impulsivity								
Urgency	8 - 32	15.19 (2.21)	18.99 (4)	19.76 (4.47)	114.78*	14.37*	13.96*	1.95
Lack of premeditation	4 - 16	12.10 (1.72)	7.69 (2.09)	9.44 (2.82)	362.28*	29.24*	11.94*	8.05*
Lack of perseverance	4 - 16	12.74 (2.04)	7.27 (2.15)	9.62 (3.06)	479.77*	34.15*	12.42*	10.30*
Sensation seeking	4 - 16	7.39 (1.43)	10.55 (2.60)	9.46 (2.53)	161.51*	18.40*	10.68*	4.50*
Drinking motives								
Enhancement motive	5 - 25	12.44 (4.61)	12.95 (4.56)	17.14 (4.04)	59.19*	1.46	10.39*	9.94*
Social order motive	5 - 25	14.60 (3.57)	15.66 (3.52)	19.97 (2.77)	123.78*	3.86*	15.85*	13.54*
Coping motive	13 - 65	17.84 (5.16)	17.19 (4.28)	27.16 (9.24)	180.29*	1.83	13.22*	17.80*
Conformity motive	5 - 25	5.70 (1.28)	5.85 (1.30)	10.42 (3.78)	348.53*	1.59	18.83*	21.99*
External correlates								
Age	18 - 30	21.73 (2.39)	21.09 (2.35)	21.61 (2.91)	32.06*	3.41*	0.44	2.17
AUDIT-Total	3 - 32	13.53 (4.95)	14.28 (5.22)	16.50 (5.49)	15.96*	1.92	5.63*	4.41*
Total alcohol units/week	4.12 - 85	17.41 (11.90)	18.94 (11.09)	20.36 (11.30)	3.41*	1.75	2.47	1.34
Number of occasions per week	0.8 - 4	2.39 (1.03)	2.54 (0.99)	2.76 (1.02)	6.59*	1.88	3.57*	2.42
Number of alcohol units per occasion	4.25 - 25	7.21 (3.14)	7.51 (3.23)	7.38 (2.95)	0.78			
Consumption speed (units per hour)	1 - 6	2.13 (1.17)	2.21 (1.24)	2.32 (1.16)	1.52			
Number of times tipsy (last 6 months)	0 - 130	20.47 (15.52)	26.61 (20.33)	23.73 (15.37)	8.20*	4.20*	1.90	1.68
Number of times drunk (last 6 months)	0 - 90	8.20 (12.17)	10.37 (13.50)	10.50 (12.65)	2.47			
Number of times completely drunk (last 6 months)	0 - 70	2.84 (7.50)	2.75 (6.09)	2.86 (4.57)	0.02			
Percentage of drunkenness (last 6 months)	0 - 100	30.95 (28.05)	24 (24.52)	31.83 (27.15)	7.53*	3.13*	0.30	2.95*
		Percentage	Percentage	Percentage	χ^2			
Gender (men – women)		63.3 – 36.7	53.3 – 46.7	55.8 – 44.2	6.96*	6.89*	2.27	0.27
Psychological disorder		11.1	7.1	8.2	3.49			
Tobacco consumption		28	18.4	25.9	9.64*	8.75*	0.22	3.76
Cannabis consumption		21.4	16.2	21.1	3.61			
Drug consumption		3.1	2.9	2.7	0.05			

Note. Differences between C1-C2, C1-C3, and C2-C3 are computed by Bonferroni-corrected post-hoc t tests (i.e. the significant threshold was set at $p < 0.012$ for comparisons based on impulsivity and drinking motives, and at $p < 0.005$ for comparisons based on external correlates) for continuous variables. * Statistically significant.

Table 4
Comparison between binge drinking clusters and non-binge drinker group on impulsivity and drinking motives.

Variable	Cluster 1 (n = 270) Occasional binge drinkers Mean (*SD*)	Cluster 2 (n = 450) Recreational binge drinkers Mean (*SD*)	Cluster 3 (n = 147) Hazardous binge drinkers Mean (*SD*)	Control group (n = 924) Non-binge drinkers Mean (*SD*)	*F*	C1-nBD	C2-nBD	C3-nBD
Impulsivity								
Urgency	15.19 (2.21)	18.99 (4)	19.76 (4.47)	17.31 (3.74)	78.46*	8.88*	7.65*	7.16*
Lack of premeditation	12.10 (1.72)	7.69 (2.09)	9.44 (2.82)	9.67 (3.26)	144.62*	11.79*	11.77*	0.81
Lack of perseverance	12.74 (2.04)	7.27 (2.15)	9.62 (3.06)	9.67 (3.62)	182.39*	13.33*	12.99*	0.15
Sensation seeking	7.39 (1.43)	10.55 (2.60)	9.46 (2.53)	8.82 (2.27)	117.47*	9.81*	12.64*	3.12*
Drinking motives								
Enhancement motive	12.44 (4.61)	12.95 (4.56)	17.14 (4.04)	9.86 (3.84)	159.72*	9.25*	13.16*	21.19*
Social order motive	14.60 (3.57)	15.66 (3.52)	19.97 (2.77)	13.34 (4.04)	146.94*	4.64*	10.40*	19.20*
Coping motive	17.84 (5.16)	17.19 (4.28)	27.16 (9.24)	17.25 (6.04)	127.00*	1.46	0.19	16.98*
Conformity motive	5.70 (1.28)	5.85 (1.30)	10.42 (3.78)	6.38 (2.33)	190.44*	4.63*	4.48*	17.68*

Note. Differences between C1-nBD, C2-nBD, and C3-nBD are computed by Bonferroni-corrected post-hoc t tests (i.e. the significant threshold was set at $p < 0.012$). * Statistically significant.

supporting the general validity of the Cooper's model (1994) and the usefulness to considerate impulsivity as a multidimensional construct. The study also provides suggestions about the potential evolution of alcohol use disorders: As hazardous binge drinkers did not mainly report high impulsivity traits, but rather pronounced drinking motives and elevated urgency, it could be hypothesized that impulsivity impairments are initially limited, and progressively develop during the transition between binge drinking and severe alcohol use disorders. However, our design did not allow to explore the causal link between these variables, and longitudinal studies are needed to test this proposal. Second, at the therapeutic level, the present findings suggest that prevention among hazardous binge drinkers should aim at modifying drinking motives and establishing adaptive emotional regulation strategies. Our results also underline that binge drinkers are not a unitary group; rather, they are separated into several subgroups with distinct psychological characteristics. Even if clinical interview and experimental tasks should be used in the future to further evaluate these psychological characteristics (notably by offering objective impulsivity measures), the current results suggest that preventive interventions need to be adapted to the targeted subgroup of binge drinkers,

Fig. 1. The three binge drinking clusters.

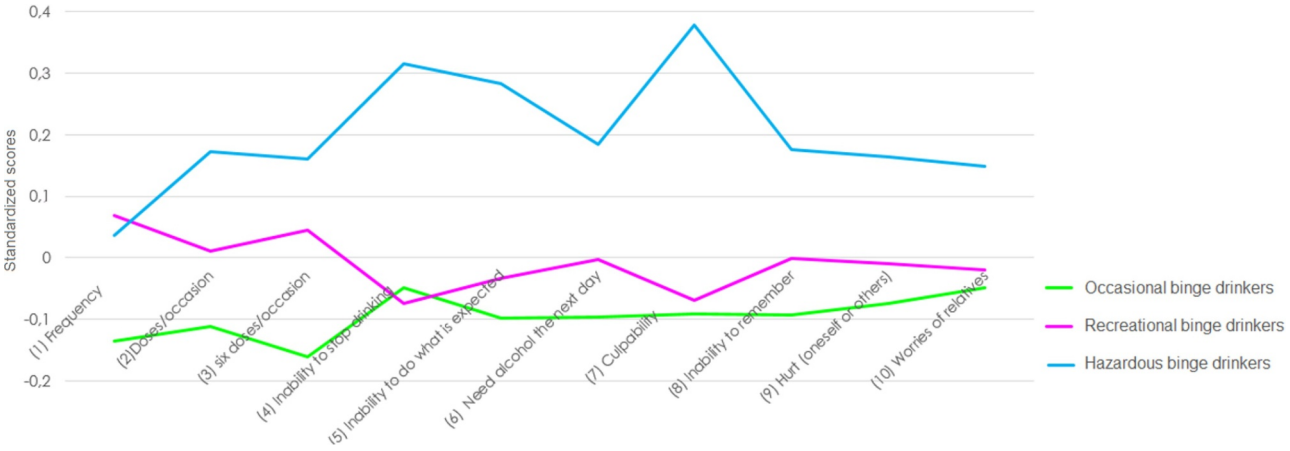

Fig. 2. Comparison of the three clusters for the 10 items of the Alcohol Use Disorders Identification Test (AUDIT).

for example by focusing on the restructuring of dysfunctional meta-cognitions (e.g., drinking alcohol to avoid negative judgments of others), or on the help to control drinking (e.g., implementation intentions; Gollwitzer, 1999).

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