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Alcohol representations are socially situated: An investigation of beverage representations by using a property generation task

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ABSTRACT

Previous research suggests that people's representations of alcoholic beverages play an important role in drinking behavior. However, relatively little is known about the contents of these representations. Here, we introduce the property generation task as a tool to explore these representations in detail. In a laboratory study ($N = 110$), and a bar field-study ($N = 56$), participants listed typical properties of alcoholic beverages, sugary beverages, and water. Each of these properties was then categorized using a previously developed, hierarchical coding scheme. For example, the property "sweet" was categorized as referring to "taste", which falls under "sensory experience", which falls under "consumption situation". Afterwards, participants completed measures of drinking behavior and alcohol craving. Results showed that alcoholic beverages were strongly represented in terms of consumption situations, with 57% and 69% of properties relating to consumption in the laboratory and the bar study, respectively. Specifically, alcoholic beverages were more strongly represented in terms of the *social context* of consumption (e.g., "with friends") than the other beverages. In addition, alcoholic beverages were strongly represented in terms of *sensory experiences* (e.g. "sweet") and *positive outcomes* (e.g. "creates fun"), as were the sugary beverages and water. In Study 1, the extent to which alcoholic beverages were represented in terms of social context was positively associated with craving and regularly consuming alcohol. The property generation task provides a useful tool to access people's idiosyncratic representations of alcoholic beverages. This may further our understanding of drinking behavior, and help to tailor research and interventions to reduce drinking of alcoholic and other high-calorie beverages.

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1. Introduction

Alcoholic beverages supply many calories and their consumption contributes to the rise in obesity (Shelton & Knott, 2014). To develop effective interventions to reduce alcohol consumption, much research has therefore focused on exploring its predictors, such as on norms, implicit and explicit attitudes, and habits (for reviews, see Rooke, Hine, & Thorsteinsson, 2008; Stacy & Wiers, 2010). Importantly, these predictors of drinking behavior all rely on specific psychological representations of alcoholic beverages, i.e. storage structures of information about the world (Barsalou, 2008). For example, someone who represents alcohol as reducing sorrow

may be motivated drink when trying to cope with an illness in the family. Furthermore, when a representation related to drinking is activated, such as the context of "socializing", this may initiate the habitual behavior to drink (Sheeran et al., 2005). Even though these and other findings clearly suggest that representations play an important role in drinking behavior (Wyer, 2007), little is known about the *content* of alcohol representations. Partially this may be because it is difficult to study them well, and because they are highly idiosyncratic. For example, while some people have a positive implicit attitude towards alcohol because it is part of their fun times with friends, others' positive attitudes may be driven by past experiences where a drink lightened up difficult situations. Here, we suggest that a property generation task can be a useful tool to examine these representations (McRae, Cree, Seidenberg, & McNorgan, 2005). To demonstrate how this tool can be used, we examined people's representations of alcoholic beverages in two

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studies. Furthermore, we examined if specific aspects of an alcohol representation were associated with the motivation to drink. We therefore also included established measures of drinking-related cognitions and behavior in our research, such as state alcohol craving, explicit motives to drink alcohol, and actual drinking choices.

1.1. Formation and expression of representations

The formation of representations occurs continuously while interacting with the world, and they emerge from, amongst others, bodily states, sensory information, and the environment (Barsalou, 2008; Barsalou, Simmons, Barbey, & Wilson, 2003; Borghi, 2015). The relevant properties of one's experiences are then stored and associated together in memory as comprehensive representations (Barsalou, 2015). These representations are based on an individuals' own learning experience, and are therefore highly idiosyncratic. The properties that are encoded from the experience of drinking a beer may for instance include sensory input (e.g. "cold", "bitter taste") and positive outcomes (e.g. "hedonic enjoyment"). Furthermore, as appetitive objects are consumed within a certain situation, representations may also include information about the physical context (e.g. "in a bar") as well as the social context ("with friends"). The beverages are thus not represented in isolation, but may include relevant contextual information (Barsalou, 2015; Barsalou et al., 2003). To the degree that one has similar experiences over time, the associations between the shared features of these experiences become increasingly entrenched in memory.

The fact that representations become increasingly entrenched in memory allows them to be easily activated again in similar situations, in order to prepare for action, such as the consumption of alcohol (Barsalou, 2009). When any part of a representation gets activated, properties in the associative pattern of the representation may then also get activated through pattern completion inferences (Barsalou, 2009). All these activated properties are then "re-experienced" (i.e., simulated; Hesslow, 2002), such that the brain is brought into a similar state as when the object was actually there and experienced (Barsalou, 2002). These processes of pattern completion and simulation assist prediction and preparation for action (Holyoak, Novick, & Melz, 1994). For instance, when a property that is part of the representation of "beer" is perceived, such as the contextual information of being at a party (Reich, Goldman, & Noll, 2004), a pattern completion process may activate associated features. This may then result in simulations of the taste and hedonic enjoyment of drinking beer, as well as approach responses that facilitate the process of actually grabbing the beer someone is offering, or walking to the bar and ordering one. Conversely, the perception of an alcoholic beverage itself may also trigger rewarding simulations through pattern completion inferences, making the beverage seem even more attractive. For instance, one might simulate feeling "buzzed", being with good friends, or dancing at a party, making the beverage seem more attractive, and thereby increasing the motivation to drink it. In short, any property may activate a previously stored situated representation in the form of simulations, which then prepare for action, such as drinking alcohol.

Although the abovementioned line of reasoning has never been directly tested in the domain of alcohol, much research provides evidence that alcohol-related representations influence thought and behavior with regards to alcohol (for reviews, see Rooke et al., 2008; Stacy & Wiers, 2010). Activating outcome representations of alcohol consumption with word exposure (e.g. "buzzed", "sexy"), for instance, increases accessibility to other alcohol-related properties and increases alcohol consumption (Hill & Paynter, 1992; Stein, Goldman, & Del Boca, 2000; Weingardt, Stacy, & Leigh, 1996). Furthermore, habits automatically initiate drinking behavior in response to a contextual drinking cue, such as thoughts about "socializing" (Aarts & Dijksterhuis, 2000; Albery, Collins, Moss, Frings, & Spada, 2015; Sheeran et al., 2005). Moreover, merely exposing people to images of alcoholic beverages can facilitate aggressive behavior, especially for people who associate drinking with aggression (Bartholow & Heinz, 2006). From a grounded cognition perspective (Papies & Barsalou, 2015), the perception of an alcoholic beverage trigger simulations of properties in the alcohol representation through pattern completion inferences, such that it triggers simulations of sensory experiences (e.g. "bitter", "sparkling"), cognitions (e.g. "aggressive") or behaviors (e.g. "drinking"). These simulations effectively prepare for action, such as the actual consumption of alcohol or aggressive behavior.

1.2. Content of representations

While many lines of research indicate that the idiosyncratic representations of alcohol are potentially important for understanding drinking behavior (for reviews, see Rooke et al., 2008; Stacy & Wiers, 2010), little is known about their content. Previous research found that representing alcoholic beverages in terms of positive expectancies (e.g. "feeling calm") rather than negative expectancies (e.g. "feeling dizzy") is correlated with alcohol consumption (Jones, Corbin, & Fromme, 2001). In another line of research, participants freely listed outcome expectancies to the prompt "Alcohol makes one …. " (Rather & Goldman, 1994; Rather, Goldman, Roehrich, & Brannick, 1992; Dunn & Goldman, 1998; Goldman, 1999). Here, participants were found to strongly represent alcoholic beverages on the dimensions of sedation-arousal and negative/antisocial-positive/social. Another line of research found that representing the act of drinking alcohol at a higher level (e.g. "quenching my thirst", "getting drunk"), rather than at a lower level (e.g. "swallowing different beverages"), is correlated with difficulty in controlling consumption (Palfai & Ostafin, 2010; Wegner & Vallacher, 1986; Wegner, Vallacher, & Dizadji, 1989). An explanation for this effect is that representations at a higher level provide a motivation to drink (Palfai & Ostafin, 2010). These studies are informative but typically only focus on one aspect of the representation, such as outcome expectancies or action identifications.

Using a property generation task allows us to examine all aspects of people's representations simultaneously. In this task, participants list typical properties of a stimulus presented to them (McRae et al., 2005; Santos, Chaigneau, Simmons, & Barsalou, 2011). Typically, participants are not aware of the construct being measured in a property generation task, rendering this a somewhat implicit measure (De Houwer & Moors, 2007). Earlier research in the domain of food (Papies, 2013), for instance, found strong representations in terms of the sensory system, hedonic features, and eating situations for attractive relative to neutral foods — examples of outcomes for chips being "salty, delicious, at night, edible". Based on this earlier research, an example outcome from the task for a beer might be "with friends, bitter, delicious, made from hops". As these representations depend on a person's earlier experiences, they are highly idiosyncratic. Furthermore, representations are highly context dependent: on a night out with friends, an alcoholic beverage likely elicits different representations than in the morning after a night of heavy drinking. This can also be reflected in the results of a property generation task.

The current work adds to the domain of alcohol by exploring the full breadth of people's representations of alcohol, including outcome expectances, sensory information, action information, and context. The outcome expectancy literature for instance focuses on the outcome expectancies aspect of people's representations. This

is also enforced in the used methods, e.g. asking participants to respond to: "Alcohol makes one …". Representations of alcohol may be much broader, however (e.g. Barsalou, 2002; Papies, 2013), including sensory information and context information. The literature on habits also suggests that this context information – independent of outcome expectancies – is vital for inducing behavior (e.g. Danner, Aarts, & de Vries, 2008). The current manuscript thus connects the outcome expectancy literature with the literature on habits, as any property including context or outcome expectancies can be listed in the property generation task. This is useful as both context and outcome expectancies may be important aspects of people's representations, and in predicting drinking behavior.

Although based on verbal reports, recent research shows that the property generation task reveals more than superficial word associations (Santos et al., 2011; Simmons, Hamann, Harenski, Hu, & Barsalou, 2008). In research by Wu and Barsalou (2009), for instance, participants were instructed to describe their imagery, engage in property generation, or list mere word associations. The distribution of properties from imagery and property generation instructions differed from those produced during word association, such that only in the first two conditions, participants listed properties that come up when one simulates engaging with the object. Furthermore, when using the property generation task in the domain of food, Papies (2013) found participants to list eating simulation properties reflecting taste and texture, rather than them merely listing superficial word associations (e.g. "monster" for cookie) or category information (e.g. "food" for chips). Thus, responses in the property generation task go beyond mere word associations.

When using the property generation task to study features of representations at the group level, the listed properties are categorized using a systematic coding scheme as described in the section *property generation task*. This allows us to learn about certain drinking traditions in a culture, such as drinking during lunch or social occasions. In contrast, by studying representations on the individual level, we can learn more about what aspects of drinking episodes are relevant to an individual, which can be used to tailor research and interventions to the individual.

2. The present research

We examined representations of alcoholic beverages using a property generation task in the laboratory at the university (Study 1) and in two local bars (Study 2). Our research was largely exploratory, but based on similar research in the domain of eating (Papies, 2013), we hypothesized that the content of people's representations of alcoholic beverages would be dominated by features of consumption situations, such as sensory features, context features, and consequences of drinking. Parallel to findings in the domain of eating (Papies, 2013), we further hypothesized that representing alcohol in terms of a consumption situation would be positively associated with measures of drinking behavior, such as alcohol craving.

3. Study 1

3.1. Methods

3.1.1. Participants

110 participants were included in the analyses (41 male; age mean = 21 years). Four additional participants indicated that they never drink alcohol, and one participant selected the same beverages for frequently consumed alcohol as for alcohol that he/she never consumed. These participants were therefore excluded from the analyses.

3.1.2. Design and stimuli

The study had a within-participants design comparing four types of beverages. As critical type of beverage, participants (1) selected their three most frequently consumed alcoholic beverages out of 12 commonly consumed alcoholic beverages (e.g. beer, white wine). As controls, participants selected (2) three alcoholic beverages with which they were familiar, but which they did not drink themselves, (3) their three most frequently consumed sugary beverages out of an array of 12 commonly consumed sugary beverages (e.g. cola, ice tea), and all participants were shown (4) a bottle of water.

3.1.3. Materials

Craving. Participants indicated the extent to which they craved an alcoholic beverage (beer, wine, cocktail etc.) on a Likert scale ranging from 0 (no craving at all) to 10 (a strong craving; Rohsenow et al., 1997). Afterwards, they indicated the extent to what extent they desired to drink water on a similar scale.

Drink choice task. Participants were informed that there was a bar opposite to the laboratory building. A picture of the bar interior and three vouchers were presented on the screen. Participants were asked what type of voucher they would like to receive, if this study offered such vouchers as rewards. They could then select one out of three options: "Soft-drink/Juice" or "Coffee/Tea" or "Beer/Wine". For the analyses, we recoded their choice as "non-alcoholic beverage" or "alcoholic beverage".

Drinking motives. The drinking motive questionnaire-revised-short form (DMQ-R-SF; Kuntsche & Kuntsche, 2009) was used to assess drinking motives (enjoyment, social, conformity, coping). Each motive was assessed with 3 items on a scale from 1 (never/almost never) to 5 (always/almost always), all $\alpha > 0.68$.

Uncontrollability of alcohol thoughts. An uncontrollability/thought-action fusion scale (Hoyer, Hacker, & Lindenmeyer, 2007) was used to assess the amount of control that participants experience over their alcohol-related thoughts. This scale has 8 items (e.g. "alcohol-related thoughts really make me drink"), to which participants could respond to from 0 (completely disagree) − 4 (completely agree), $\alpha = 0.80$.

Temptation. To assess alcohol temptations experienced by participants, we used a scale of 9 items (e.g. "When you feel alone, does that make you want to drink alcohol?"; Collins & Lapp, 1992; $\alpha = 0.82$). Participants could respond from 1 (never) to 9 (always).

AUDIT. The alcohol use disorders identification test (AUDIT; Saunders, Aasland, Babor, de la Fuente, & Grant, 1993) was used to detect harmful alcohol usage. It has 10 items (e.g. "In the last year, did you need alcohol in the morning to get going?"), $\alpha = 0.79$. Sum scores of 8 or over indicate hazardous drinking behavior, which is the increased risk of negative physical and mental health consequences for the drinker.

Additional measures. At the end, participants were asked how many alcoholic beverages they drink on a normal day, and on a "party night". Participants were furthermore asked to rate on a scale from each selected beverage on liking, frequency of consumption, and the extent to which the beverages were consumed in similar contexts. This was all done on a scale from 1 (not at all) to 7 (very much). As habits have been argued to constitute frequent behaviors in a stable context (Aarts & Dijksterhuis, 2000; Danner et al., 2008), we multiplied both these ratings, allowing for a habit index ranging from 1 (no drinking habit at all) to 49 (very strong drinking habit). Participants were asked to indicate how they evaluate being drunk on a scale from 1 (negative) to 7 (positive).

Property generation task. For the property generation task, participants were informed that they would see several objects. They were asked to write down the typical properties of each object that

spontaneously came to mind (McRae et al., 2005; Papies, 2013), and to name at least 5 properties. To illustrate, participants were shown images of two example objects (e.g., *sponge*) and potential properties (such as "yellow", "soft", "wet").

In the actual task, participants were presented with images of the 10 beverages as described in the design and stimuli section (i.e. 3 frequently consumed alcoholic beverages, 3 alcoholic beverages the participant never consumes, 3 frequently consumed sugary beverages, and water), and 10 neutral objects (e.g. envelope, pen) in random order, with a textbox to list the properties. The images were presented on the screen until the participant finished responding. There was a 1500 ms interval between objects.

We coded each property using a previously developed coding scheme consisting of 41 categories organized in a hierarchical structure (Keesman, Papies, Lindner, & Barsalou, 2017). The main overarching categories contained consumption situations (i.e. any aspect of a consumption episode, such as the taste of the object), non-consumption situations (i.e. any aspect of a situation unrelated to consumption, such as how the object is produced or stored), and situation-independent (i.e. any aspect that is present in both a consumption as well as in a non-consumption situation, such as the ingredients of the object or its visual properties). To further clarify the distinction between these categories, red wine is used as an example beverage. Some properties are consumption-situation specific, such that "taste" is only experienced when consuming the product. Some properties are non-consumption specific, such that "stored in a bottle" only holds true for red wine in the "non-consumption situation" of storage − wine cannot be stored and consumed at the same time. The visual property of "red", on the other hand, is true for red wine regardless of its situation: it is true both when it is being consumed and when it is being stored. Thus, some properties are consumption-situation specific (e.g. taste), some are non-consumption situation specific (e.g. storage), and some are independent of these situations (e.g. visual). This coding scheme is based on previous coding schemes (McRae et al., 2005; Papies, 2013; Wu & Barsalou, 2009), and was further adapted to capture experiences with consumptive objects. An overview of the category structure with examples is included as Fig. 1.

The first author and an independent rater coded the data of the property generation task. Of the 41 available coding categories, 35 were used. We summed all unique properties per beverage, which indicated that a total of 3224 coding decisions were made by each rater. We used an online calculator to calculate the inter-rater agreement and reliability (Geertzen, 2012). Despite the large number of coding categories, the inter-rater agreement was 71.8%. Importantly, reproducibility as measured by Krippendorff's alpha was fair, at 0.70 (Cohens's kappa = 0.70), which indicates that disagreements were not systematic. On average, participants generated 5.49 properties per beverage. We analyzed the coding of the first author. We first calculated the percentage of properties that each category contained and then averaged those over the beverages per beverage category (frequently consumed alcohol, alcohol that is never consumed, frequently consumed sugary beverages).[1] All listed properties and how they were categorized can be found in the supplementary materials.

3.2. Procedure

After providing informed consent, participants performed the study on a computer in an individual cubicle. Participants first

selected the beverages as described above. Then, they reported their cravings. The property generation task followed. Then, participants again reported current alcohol cravings, and made the hypothetical drink choice. This was followed by all other questionnaires as described in the materials section. Finally, participants provided demographic information.

3.3. Results

3.3.1. General content of representations

We controlled for multiplicity using Bonferroni corrections, α was set at 0.05/3 tests = 0.0167. On average, 57% of the representations of frequently consumed alcoholic beverages referred to a consumption situation, 95% CI [53, 61]. Confirming our hypothesis, this was higher than for alcoholic beverages that are never consumed and water (respectively, mean = 49%, 95% CI [45, 52]), $t(109) = 4.67$, $p < 0.001$, $d = 0.45$, and (mean = 42%, 95% CI [37, 46]), $t(109) = 6.55$, $p < 0.001$, $d = 0.62$. Contrary to our hypothesis, however, frequently consumed alcoholic beverages were not more strongly represented in terms of their consumption than sugary beverages (mean = 61%, 95% CI [57, 64]), $t(109) = 2.14$, $p = 0.035$, $d = 0.20$. There even was a trend in the direction of sugary beverages being more strongly represented in terms of consumption than alcohol. For details about the specific content of people's representations, see the supplementary materials. For a draught beer, for example, some of the listed properties were "bitter", "tasty", "friends", "tipsy", and "pub."

3.3.2. Exploring consumption representations in more detail

We then explored the consumption-related representations in more detail. The distribution of properties indicated that all beverages were primarily represented in terms of sensory experiences, context, and immediate positive consequences of consumption, see Fig. 2. To explore the sizes of the differences in consumption representations among the different types of beverages, we used an estimation approach. We reported Cohen's *d* standardized mean differences as point-estimates, and we reported their 95% confidence intervals. For representations in terms of drinking context, the size of the difference between frequently consumed alcoholic beverages and the other beverages was: $d = 0.22$ with 95% CI [0.03, 0.41] for alcohol that is never consumed; $d = 0.53$ with 95% CI [0.33, 0.73] for water; $d = 0.42$ with 95% CI [0.23, 0.62] for sugary beverages. For representations in terms of sensory experiences, the size of the difference between sugary beverages and the other beverages was: $d = 0.60$ with 95% CI [0.40, 0.80] for frequently consumed alcoholic beverages; $d = 0.66$ with 95% CI [0.45, 0.87] for alcohol that is never consumed; $d = 0.92$ with 95% CI [0.70, 1.14]; for water. For representations in terms of positive consequences, the size of the difference between frequently consumed alcoholic beverages and the other beverages was: $d = 0.55$ with 95% CI [0.35, 0.75] for alcohol that is never consumed; $d = -0.27$ with 95% CI [−0.45, −0.07] for sugary beverages; $d = -0.27$ with 95% CI [−0.46, −0.08] for water.

3.3.3. Exploring context-related representations in more detail

Because alcoholic beverages were more strongly represented in terms of drinking context than the other types of beverages, we examined this drinking context in more detail. Visual inspection indicated that for frequently consumed alcoholic beverages, social context (e.g. "with friends") was the most prominent category, which is shown in Fig. 3. Indeed, for representations in terms of social context, the size of the difference between frequently consumed alcoholic beverages and the other beverages was: $d = 0.38$ with 95% CI [0.18, 0.57] for alcoholic beverages that are never consumed; $d = 0.59$ with 95% CI [0.39, 0.79] for sugary

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[1] Due to a programming error, 32 participants received only two of their three selected beverages per beverage category during the task. Including this as a between-subjects factor did not have an effect on the results, $F < 1$.
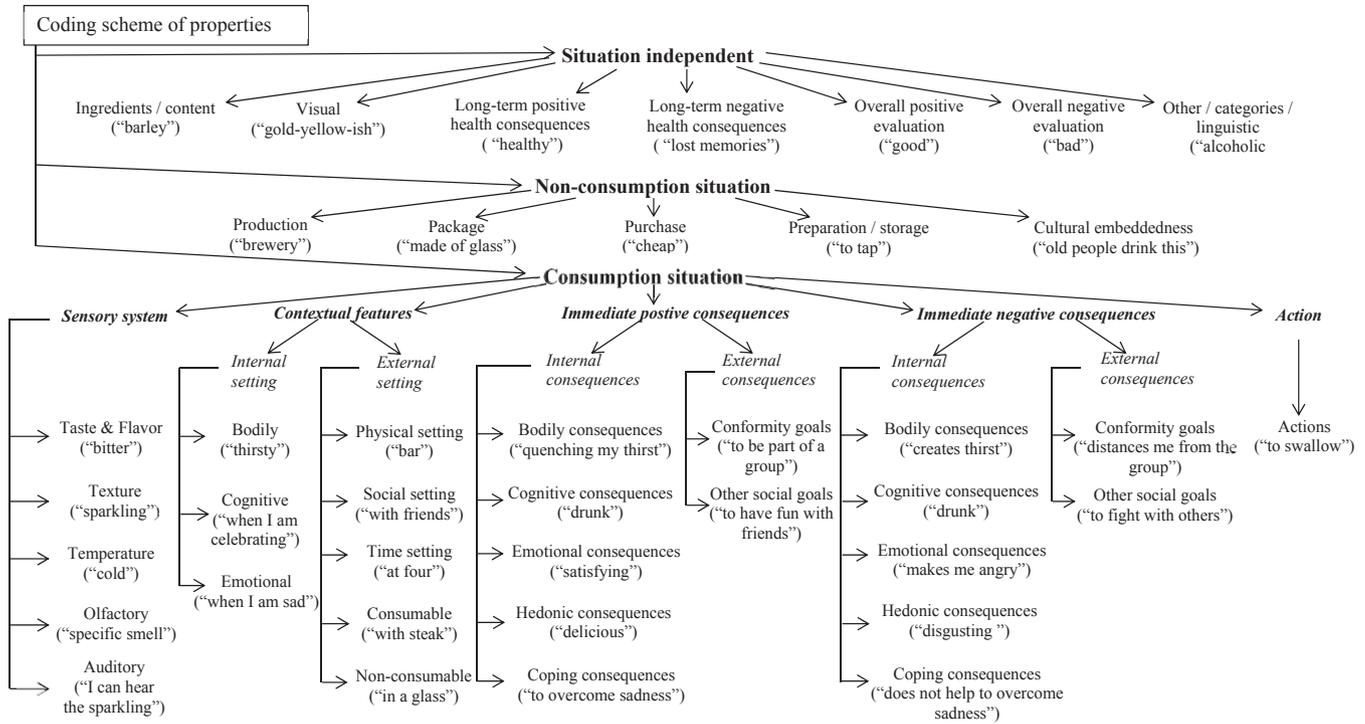
Fig. 1. To code a property, follow the hierarchical structure to the best fitting category and/or subcategory. For instance, "bitter" is experienced in a **consumption situation**, by the **sensory system**, and it is a **taste**. "Bitter" is thus coded under Taste & Flavor.
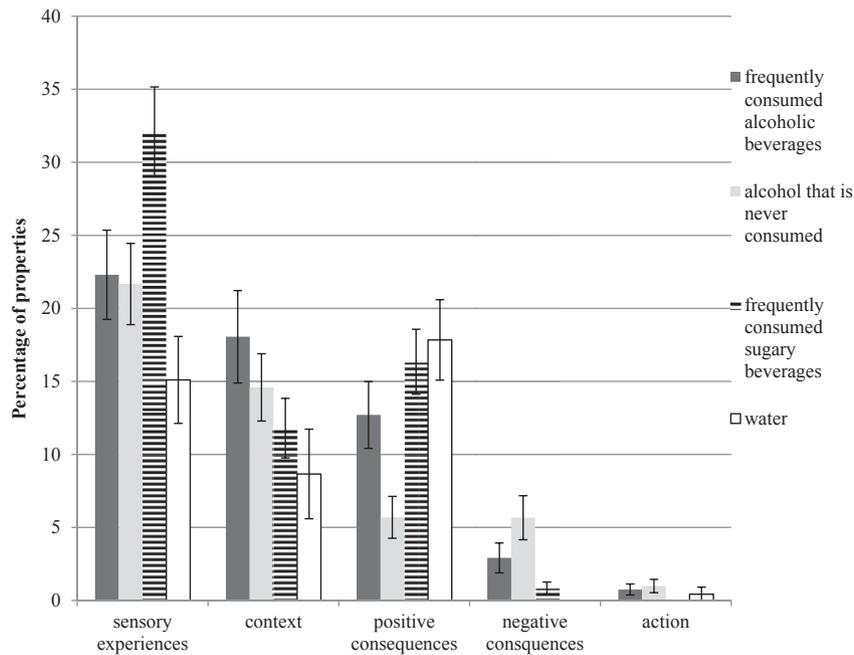

Fig. 2. The consumption representation of each beverage in Study 1, presented with 95% confidence intervals. Overall, participants strongly represented the beverages in terms of the sensory experiences, positive consequences, and context of consumption. Frequently consumed alcoholic beverages were more strongly represented in terms of context than the other beverages.

beverages; $d = 42$ with 95% CI [0.23, 0.62] for water. For insights into the specific content of people's social context representations, see the supplementary materials. For a draught beer, some of the listed properties were "when it is gemütlich (social-cozy)", "friends", "you do not drink it when alone", "together."

3.3.4. Exploring the representations of long-term negative health consequences

The caloric and other unhealthy aspects of frequently consumed alcoholic beverages did not seem salient in people's representations, with only 1.18% of properties being related to the long-term
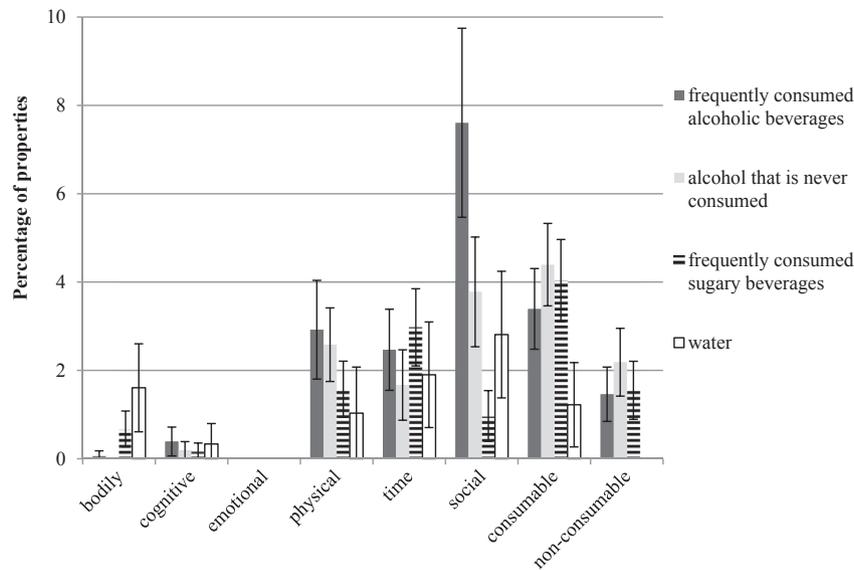
Fig. 3. The types of context representation of each beverage in Study 1, presented with 95% confidence intervals. Participants represented the frequently consumed alcoholic beverages more in terms of the *social* context relative to the other types of context and to the other types of beverages.

negative consequences of drinking (95% CI [0.39, 1.96]). See also the supplementary materials for the specific properties listed.

3.3.5. Associations with craving and drinking behavior

We found that only the extent to which participants represented alcoholic beverages in terms of social context was positively associated with various measures of drinking behavior, see Table 1. Results show that people who had a strong social context representation of alcohol also had stronger alcohol cravings and intrusive thoughts about alcohol, found alcohol harder to resist, and reported to drink more alcohol. Most of these measures were also positively correlated with one another.

3.4. Discussion

We used a property generation task to assess representations of beverages, and showed that beverages were strongly represented in terms of their consumption. Furthermore, alcoholic beverages that participants frequently consumed were more represented in terms of their consumption than alcoholic beverages that participants infrequently consumed and water. In contrast, soft-drinks were more represented in terms of their consumption than these alcoholic beverages.

When examining the consumption representations in more detail, beverages were all found to be largely represented in terms of sensory experiences, context, and immediate positive consequences of consumption. Immediate negative consequences of consumption and motor action properties were largely absent from people's representations of the beverages. Importantly, and in line with our hypothesis, relative to the other beverages, alcoholic beverages were more represented in terms of the context of consumption, especially the *social* context of consumption (e.g. "with friends"). On the other hand, alcoholic beverages were comparatively less represented in terms of sensory experiences than soft-drinks, and were less represented in terms of immediate positive consequences than both soft-drinks and water.

We found that for the frequently consumed alcoholic beverages, social context representation was associated with various measures of the motivation to drink alcohol, such as the choice for an alcoholic beverage, state alcohol craving, and uncontrollability over

alcohol-related thoughts. Additionally, the several alcohol-related measures included in this study were mostly correlated with each other.

4. Study 2

As context influences how people think about alcohol (Reich et al., 2004), we conducted Study 2 in a bar environment. This allowed us to assess alcohol representations in another sample, and in a more natural drinking environment than the laboratory. We reasoned that the expression of representations in terms of consumption could be higher in this natural drinking environment than in the non-drinking environment of the university laboratory used in Study 1. We again examined the representation of alcoholic beverages, and whether this representation is associated with alcohol consumption.

4.1. Methods

4.1.1. Participants

56 participants were included in the analyses (29 male; age mean = 29 years). One participant listed only one property per beverage and was therefore excluded from the analyses.

4.1.2. Design and stimuli

For the sake of brevity in the field setting, we limited the number of stimuli and measures. The study had a within-participants design comparing (1) frequently consumed alcoholic beverages, (2) frequently consumed sugary beverages, and (3) water. We used draught beer, white wine, ale, cola, and ice-tea as stimuli, based on the most frequently selected beverages in Study 1. For the analyses, we selected the alcoholic and sugary beverage that the participant indicated to drink most frequently. If there was no difference, the one they liked the most, and if there was again no difference, we computed an average of the scores for these multiple beverages.

4.1.3. Materials

Craving. Participants indicated the extent to which they currently craved their favorite alcoholic beverage from 1 (no

Table 1
Study 1: Partial correlation matrix for social context representation and scores on measures of drinking behavior, controlling for gender effects, reported with 95% confidence intervals.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1 Social context representation	—													
2 Alcohol choice	0.23 [0.03, 0.40]	—												
3 Alcohol craving	0.18 [−0.01, 0.36]	0.46 [0.30, 0.60]	—											
4 Drinking at party	0.20 [0.00 0.37]	0.32 [0.14, 0.49]	0.30 [0.12, 0.47]	—										
5 AUDIT score	0.18 [−0.016, 0.35]	0.26 [0.07, 0.43]	0.31 [0.13, 0.48]	0.68 [0.57, 0.77]	—									
6 Temptation	0.25 [0.06, 0.42]	0.28 [0.10, 0.45]	0.39 [0.22, 0.54]	0.37 [0.20, 0.53]	0.61 [0.48, 0.72]	—								
7 Uncontrollability	0.23 [0.04, 0.40]	0.30 [11, 0.46]	0.40 [0.23, 0.55]	0.32 [0.14, 0.48]	0.42 [0.25, 0.57]	0.63 [0.50, 0.73]	—							
8 Enjoyment motive	0.12 [−0.07, 0.30]	0.12 [−0.07, 0.31]	0.13 [−0.06, 0.31]	0.40 [0.23, 0.55]	0.45 [0.28, 0.59]	0.28 [0.09, 0.44]	0.10 [−0.09, 0.28]	—						
9 Social motive	0.12 [−0.07, 0.31]	−0.03 [−0.22, 0.16]	0.23 [0.04, 0.40]	0.21 [0.02, 0.38]	0.23 [0.04, 0.40]	0.26 [0.07, 0.43]	0.12 [−0.07, 0.31]	0.50 [0.34, 0.63]	—					
10 Conformity motive	−0.00 [−0.19, 0.19]	−0.19 [−0.36, 0.01]	0.16 [−0.04, 0.34]	−0.03 [−0.22, 0.16]	0.16 [−0.03, 0.34]	0.20 [0.01, 0.37]	0.21 [0.02, 0.39]	0.17 [−0.02, 0.35]	0.39 [0.21, 0.54]	—				
11 Coping motive	0.16 [−0.03, 0.34]	0.36 [0.18, 0.52]	0.14 [−0.05, 0.32]	0.17 [−0.02, 0.35]	0.26 [0.07, 0.43]	0.47 [0.30, 0.60]	0.33 [0.15, 0.49]	0.22 [0.03, 0.39]	0.13 [−0.06, 0.31]	0.12 [−0.07, 0.31]	—			
12 Liking of taste	0.06 [−0.13, 0.25]	0.21 [0.02, 0.38]	0.13 [−0.32, 0.06]	0.14 [−0.05, 0.32]	0.21 [0.02, 0.39]	0.29 [0.10, 0.45]	0.09 [−0.10, 0.28]	0.17 [−0.02, 0.35]	0.25 [0.06, 0.42]	−0.01 [−0.20, 0.18]	0.11 [−0.08, 0.30]	—		
13 Habit strength	0.04 [−0.15, 0.23]	0.11 [−0.08, 0.29]	0.20 [0.01, 0.37]	0.15 [−0.05, 0.33]	0.16 [−0.03, 0.34]	0.20 [0.01, 0.38]	0.11 [−0.08, 0.29]	0.06 [−0.12, 0.25]	0.25 [0.06, 0.42]	0.06 [−0.13, 0.25]	0.06 [−0.13, 0.25]	0.26 [0.08, 0.43]	—	
14 Perspective on being drunk	0.01 [−0.18, 0.20]	0.05 [−0.14, 0.23]	0.18 [−0.01, 0.36]	0.31 [0.12, 0.46]	0.31 [0.12, 0.47]	0.35 [0.18, 0.51]	0.22 [0.03, 0.40]	0.42 [0.25, 0.57]	0.34 [0.16, 0.50]	0.10 [−0.09, 0.29]	0.17 [−0.02, 0.35]	0.18 [−0.01, 0.36]	0.15 [−0.04, 0.33]	—
Means (SD)	7.6 (11.5)	0.44 (0.50)	4.7 (2.6)	7-8 drinks	11.7 (5.6)	2.4 (1.1)	0.9 (0.6)	3.1 (0.8)	3.0 (1.1)	1.6 (0.7)	1.6 (5.4)	5.5 (1.1)	20.7 (8.4)	3.8 (1.6)

craving at all) to 5 (a strong craving; Rohsenow et al., 1997).

Property generation task. On average, participants listed 4.21 properties per beverage. The data were again independently coded by the same two raters as in Study 1. Out of 41 coding categories, 33 were used, and each coder made 667 unique coding decisions. Overall inter-rater agreement was 71.9%. A fair reliability was again achieved with Krippendorff's alpha at 0.71 (Cohen's kappa = 0.71). The coding from the first author was again used for the analyses. All properties can be found in the supplementary materials.

Drinking motives. The same drinking motives questionnaire (DMQ-R-SF; Kuntsche & Kuntsche, 2009) was used as in Study 1, all $\alpha > 0.69$.

Uncontrollability. The same measure of uncontrollability of alcohol-related thoughts (Hoyer et al., 2007) was used as in Study 1, $\alpha = 0.76$.

AUDIT. The alcohol use disorders identification test (AUDIT; Saunders et al., 1993) was again used to detect hazardous drinking behavior, $\alpha = 0.67$.

Additional measures. Liking and the index of habit strength were computed in the same way as in Study 1, using scales from 1 (not at all) to 7 (very much) (Danner et al., 2008). Participants also indicated whether they evaluated being drunk as primarily positive or as primarily negative.

4.1.4. Procedure

The study was conducted on three Fridays and Saturdays after 8 p.m. in two neighboring bars in the center of a small town in the Netherlands. Patrons entering the bar were asked if they wanted to participate in the study. If they agreed, they were handed the paper questionnaire, of which the first page consisted of a consent form. Six versions of the questionnaire were created with each one having a different random order of the three beverages included. Participants' drink order was then immediately taken by the bartender, but through coordination of the researchers with the bartenders, the participants received their beverage only after completing the questionnaire. We kept track of all drinks that were ordered by the participants in the course of the evening, and participants were made aware of this in the consent form. After this stage, the procedure was largely the same as in Study 1, but Study 2 contained fewer stimuli and fewer measures related to drinking behavior. Participants provided demographic information at the end of the questionnaire.

4.2. Results

4.2.1. General content of representations

We applied Bonferroni correction to control for multiplicity, with $\alpha = 0.05/2$ tests = 0.025. Overall, the pattern of content in people's representations was similar to the pattern found in Study 1. For the alcoholic beverages, 70% of properties referred to consumption, 95% CI [64, 76], again confirming our hypothesis that this would be more than for water (mean = 57%, 95% CI [50, 65]), $t(53) = 2.82$, $p = 0.007$, $d = 0.38$. Similar to Study 1, frequently consumed alcoholic beverages were not more strongly represented in terms of their consumption than sugary beverages (mean = 80%, 95% CI [74, 87]), $t(47) = 2.13$, $p = 0.038$, $d = 0.30$. In contrast, there was a trend in the direction of sugary beverages being more strongly represented in terms of consumption than alcoholic beverages.

4.2.2. Exploring consumption representations in more detail

When exploring the consumption-related representations in more detail, similar trends were observed as in Study 1, see Fig. 4. The distribution of properties again indicated that all beverages were primarily represented in terms of sensory experiences, context, and immediate positive consequences of consumption. For representations in terms of drinking context, the size of the difference between frequently consumed alcoholic beverages and the other beverages was: $d = 0.24$ with 95% CI [−0.04, 0.51] for water; $d = 0.20$ with 95% CI [−0.09, 0.48] for sugary beverages. For representations in terms of sensory experiences, the size of the difference between sugary beverages and the other beverages was: $d = 0.43$ with 95% CI [0.13 0.73] for frequently consumed alcoholic beverages; $d = 0.73$ with 95% CI [0.41, 1.04] for water. For representations in terms of positive consequences, the size of the difference between frequently consumed alcoholic beverages and the other beverages was: $d = −0.06$ with 95% CI [−0.32, 0.21] for sugary beverages; $d = 0.04$ with 95% CI [−0.24, −0.32] for water.

4.2.3. Exploring context-related representations in more detail

We examined the representations in terms of drinking context in more detail because alcoholic beverages were more strongly represented in terms of drinking context than the other types of beverages in Study 1, and a similar trend was visible for Study 2 (see Fig. 5). Similar to Study 1, visual inspection indicated that for
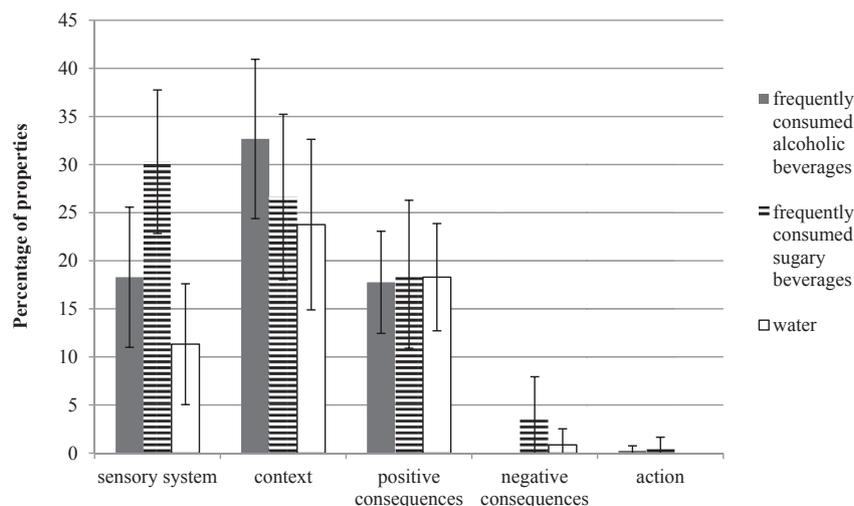

Fig. 4. The consumption representation of each beverage in Study 2, presented with 95% confidence intervals. Overall, participants strongly represented the beverages in terms of the sensory experiences, positive consequences, and context of consumption.
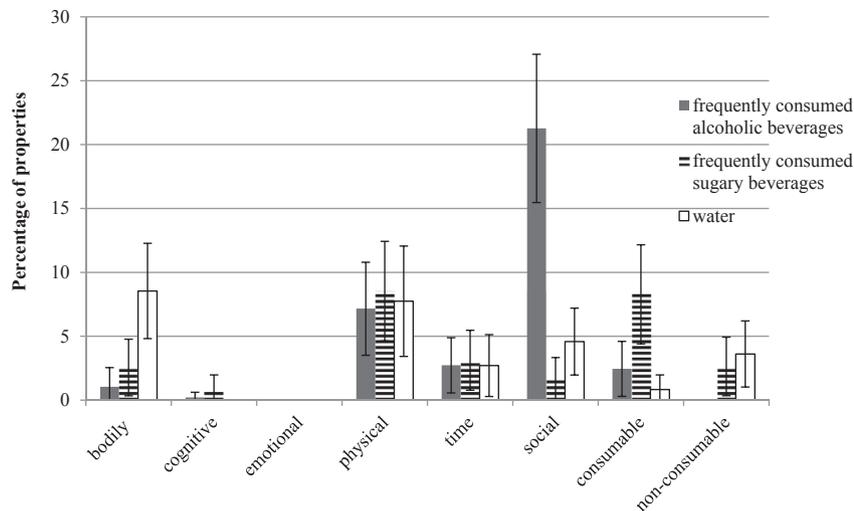
Fig. 5. The types of context representation of each beverage in Study 2, presented with 95% confidence intervals. Participants represented the frequently consumed alcoholic beverages more in terms of the *social* context relative to the other types of context, and other types of beverages.

frequently consumed alcoholic beverages, social context was the most prominent representation category. For representations in terms of social context, the size of the difference between frequently consumed alcoholic beverages and the other beverages was: $d = 0.92$ with 95% CI [0.58, 1.25] for sugary beverages; $d = 0.81$ with 95% CI [0.50, 1.11] for water. For specific examples of people's social context representations, see the supplementary materials.

4.2.4. Exploring the representations of long-term negative health consequences

The results concerning the long-term negative consequences of drinking were similar to Study 1, with only 1.30% of all properties 95% CI [−0.25, 2.84] being related to them.

4.2.5. Associations with craving and drinking behavior

A similar correlation matrix was computed for Study 2 as for Study 1, see Table 2. Alcohol consumption in the bar was correlated with *state* cravings for alcohol. Surprisingly, there was an overall lack of correlation between participants' actual consumption of alcohol and the established *trait* measures of drinking behavior, and also with representations in terms of social context.

4.3. Discussion

Regarding the representations of alcoholic beverages, the results of this study were highly similar to those of Study 1. The representations of all beverages were strongly related to their consumption, and especially for soft-drinks. More specifically, the beverages were largely represented in terms of sensory experiences of drinking, drinking context, and immediate positive consequences of consumption. We again found differences in these representations between beverages. Soft-drinks were more represented in terms of the sensory experiences of consumption than the alcoholic beverages and water. Furthermore, as in Study 1, alcoholic beverages were more represented in terms of the social context of consumption than the other beverages. This representation in terms of social context was more pronounced in the bar environment than in the laboratory environment from Study 1.

In Study 2, the representation in terms of social context was only positively associated with current craving for an alcohol beverage, and was unexpectedly negatively associated with uncontrollability over alcohol-related thoughts. In addition, there was a marginal negative association with the AUDIT score and a measure of drinking for coping motives, which was also unexpected. Furthermore, the actual number of alcoholic beverages consumed in the bar was only associated with current alcohol craving and with drinking for coping motives, and not with any of the other established measures of drinking. This lack of association between alcohol-related measures and the actual consumption of alcohol is not in line with previous work on drinking behavior, including Study 1 of the current paper, which typically finds positive associations between these measures (e.g. Danner et al., 2008; Kuntsche, Knibbe, Gmel, & Engels, 2005; Saunders et al., 1993). Assessing drinking behavior in a bar might be suboptimal for studying predictors of drinking behavior and the motivation to drink. More specifically, people typically go to a bar to drink alcohol, and hence the decision to drink might already have been made before participants entered the bar. We further address this potential limitation in the general discussion.

5. General discussion

In two studies, we examined people's idiosyncratic representations of alcoholic beverages using a property generation task in a university laboratory environment (Study 1) and in a local bar (Study 2). Across studies, participants primarily represented alcoholic beverages in terms of the sensory experiences, context, and immediate positive consequences of drinking the beverages. In contrast, the caloric and other unhealthy aspects of frequently consumed alcoholic beverages did not seem salient in people's representations. In a more detailed examination, we found that frequently consumed alcoholic beverages were especially strongly represented in terms of the *social* context of consumption (e.g. "with friends", see the supplemental materials for such specific content).

In addition, Study 1, examining a student sample, revealed a small but consistent positive association between the social context representation of alcohol and measures of alcohol craving and actual drinking. This finding is in line with much earlier research, which has shown that people drink in social contexts (Cooper, 1994; Kuntsche & Kuntsche, 2009; Kuntsche et al., 2005). Previous research largely focused on people's motives to drink to make social interactions more enjoyable. Our results on representations add to this literature by suggesting that the social context itself,

Table 2
Study 2: Partial correlation matrix for social context representation and scores on measures of drinking behavior, controlling for gender effects, reported with 95% confidence intervals.

	1	2	3	4	5	6	7	8	9	10	11	12
1 Social context representation	—											
2 Alcohol choice	0.11 [−0.18, 0.38]	—										
3 Alcohol craving	0.18 [−0.10, 0.44]	0.38 [0.11, 0.59]	—									
4 AUDIT score	−0.24 [−0.48, 0.04]	0.19 [−0.10, 0.44]	0.32 [0.05, 0.54]	—								
5 Uncontrollability	−0.34 [−0.56, 0.06]	0.17 [−0.12, 0.43]	0.18 [−0.10, 0.43]	0.67 [0.49, 0.80]	—							
6 Enjoyment motive	−0.04 [−0.31, 0.24]	0.14 [−0.15, 0.40]	0.30 [0.03, 0.53]	0.55 [0.32, 0.71]	0.59 [0.38, 0.74]	—						
7 Social motive	0.03 [−0.25, 0.31]	−0.01 [−0.29, 0.27]	0.04 [−0.24, 0.31]	0.43 [0.18, 0.63]	0.43 [0.18, 0.63]	0.67 [0.49, 0.80]	—					
8 Conformity motive	−0.16 [−0.42, 0.12]	0.08 [−0.21, 0.35]	0.06 [−0.22, 0.33]	0.21 [−0.07, 0.46]	0.22 [−0.05, 0.47]	0.34 [0.07, 0.56]	0.34 [0.08, 0.56]	—				
9 Coping motive	−0.28 [−0.51, 0.01]	0.37 [0.10, 0.59]	0.28 [0.01, 0.51]	0.37 [0.10, 0.58]	0.40 [0.14, 0.60]	0.43 [0.18, 0.63]	0.33 [0.06, 0.55]	0.56 [0.34, 0.72]	—			
10 Liking of taste	0.22 [−0.10, 0.43]	−0.02 [−0.31, 0.26]	0.25 [−0.03, 0.49]	0.10 [−0.18, 0.37]	0.14 [−0.14, 0.41]	0.19 [−0.09, 0.45]	0.19 [−0.10, 0.44]	0.11 [−0.18, 0.37]	0.16 [−0.13, 0.42]	—		
11 Habit strength	0.12 [−0.21, 0.34]	0.06 [−0.23, 0.34]	0.49 [0.24, 0.68]	0.31 [0.04, 0.55]	0.25 [−0.03, 0.50]	0.25 [−0.03, 0.50]	0.19 [−0.09, 0.45]	0.23 [−0.05, 0.48]	0.34 [0.06, 0.56]	0.55 [0.31, 0.72]	—	
12 Perspective on being drunk	0.14 [−0.17, 0.41]	0.06 [−0.25, 0.35]	−0.01 [−0.31, 0.29]	0.16 [−0.14, 0.44]	0.17 [−0.12, 0.45]	0.44 [0.16, 0.65]	0.38 [0.10, 0.61]	0.12 [−0.18, 0.40]	−0.11 [−0.39, 0.20]	0.01 [−0.29, 0.30]	−0.24 [−0.51, 0.06]	—
Means (SD)	20.2 (20.5)	1.6 (0.9)	4.0 (0.9)	9.5 (4.9)	1.8 (0.6)	2.3 (0.9)	2.7 (1.0)	1.2 (0.4)	1.6 (0.7)	6.0 (1.3)	26.6 (13.3)	0.7 (0.4)

irrespective of the outcome expectancies of drinking in the social domain, may contribute to the motivation to drink alcohol. In sum, Study 1 suggests that alcoholic beverages are strongly represented in terms of the social context of their consumption, and that representations are associated with drinking behavior. This conclusion resonates well with habit research (Sheeran et al., 2005), showing that social context is an important aspect of drinking alcoholic beverages among student participants.

In Study 2, the established *trait* measures of drinking behavior such as the AUDIT were not correlated with the actual consumption of alcohol in the bar. This is surprising, because these measures are considered good predictors of drinking behavior. Lack of this basic correlation between predictors of drinking and actual drinking behavior in this study might point to a low validity of these measures in the current study. The fact that other hypothesized correlations were absent in this study may therefore not be informative. In addition, when examining correlations with social context representations, some of the correlations were in opposite directions relative to the findings from Study 1. These results may be explained by the different demographics and characteristics of this non-student sample, or by low validity of the established measures in the current study. Furthermore, our participants likely attended the bar in order to drink, thus constituting a specific subsample of people. This might have led to the limited variance of only 5 participants not consuming any alcoholic beverage. In hindsight, it might have been better to conduct this study in a naturalistic drinking environment that also attracts non-drinkers, such as a cinema. Although few conclusions about craving and drinking behavior can be drawn from Study 2, the results concerning the content of people's representations of alcoholic beverages are highly consistent with Study 1. Specifically, they show that alcoholic beverages are uniquely represented in terms of the social context of consumption.

5.1. Implications and future research

The representations that people form during their lifetime play a key role in driving their behavior (Ackerman, Nocera, & Bargh, 2010). Therefore, obtaining systematic insight into their content is vital to advance our understanding of drinking behavior. For instance, future research might look into the link between representations and implicit attitudes, and what content in a representation leads to a positive attitude towards alcohol and to impulsive drinking (Rooke et al., 2008; Stacy & Wiers, 2010). Similarly, alcohol priming research might benefit from increased insight into alcohol representations. Here, activating alcohol-related representations (e.g. "buzzed", "sexy") has been found to increase alcohol consumption (Hill & Paynter, 1992; Stein et al., 2000; Weingardt et al., 1996). The replicability of these so-called social priming effects has been called into question in recent years (for a review on this issue, see Cesario, 2014). It might be the case that such priming effects become more robust and reliable if the primes are tailored to an individual's alcohol representation. For instance, if participants do not represent alcohol in terms of features like "sexy", no priming effects on alcohol consumption are to be expected when they are exposed to the word "sexy". The property generation task offers a way to provide tailored prime concepts to participants, thereby potentially allowing for more reliable priming effects.

In a similar vein, interventions to reduce drinking are most effective when tailored to the individual (Krebs, Prochaska, & Rossi, 2010; Ringold, 2002). For instance, individuals who represent alcohol in terms of the social context of consumption might benefit more from an intervention that targets social norms or peer resistance than from education on the long-term health risks of drinking. However, when the long-term negative health consequences of drinking are not particularly salient, such as in our samples, the effectiveness of an intervention to reduce drinking might benefit from including education on weight and other health-related consequences of drinking. The property generation task might be a useful tool to tailor interventions by first assessing peoples' representations of alcoholic beverages. This task may thus supplement explicit motive questionnaires and interview methods in this regard, as property generation can be administered quickly and at low cost. Furthermore, the property generation task does not trigger participants to consciously reflect on what makes them drink. Considering that explicit measures of motivation or attitudes tap into different processes than implicit measures such as the property generation task (Nosek, Hawkins, & Frazier, 2011; Thrash, Maruskin, & Martin, 2012), it would be useful to further study whether the property generation task predicts long-term drinking outcomes over and above the current explicit measures of drinking motives.

The focus of this article has been on the representations of alcoholic beverages and the link with their consumption, but the property generation task as a method can also be relevant in the domain of eating. A recent study with the property generation task for instance found that palatable foods are strongly represented in terms of their consumption, and consumption representations were correlated with the desire to eat (Papies, 2013). While the studies reported here are only a first, preliminary application of this task to understanding alcohol representations, we hope that they inspire further work to fully understand the regulation of appetite, such as of eating and drinking behavior.

Appendix A. Supplementary data

Supplementary data related to this article can be found at https://doi.org/10.1016/j.appet.2017.10.019.

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