Short Communication

Pick your poison: Stimuli selection in alcohol-related implicit measures

Kristen P. Lindgren a,b,⁎, Erin C. Westgate a, Jason R. Kilmer a, Debra Kaysen a, Bethany A. Teachman b

a University of Washington, United States
b University of Virginia, United States

ARTICLE INFO

Keywords:
Drinking
Implicit cognition
Individual differences
Idiographic approaches
Methodology

ABSTRACT

It is common for people to report strong preferences for certain types of alcohol, often as a function of past positive or negative experiences with particular types of drinks. Despite this individual difference, implicit measures related to alcohol frequently use nomothetic approaches – i.e., use a standard set of alcohol beverage stimuli – which may not match individuals’ actual drinking behavior. Moreover, this mismatch may account for some of the inconsistencies across studies using implicit measures. The present study used an idiographic variant of the Implicit Association Test (IAT) in which participants (N = 300) selected alcohol images that matched their drinking behavior (non-drinkers selected what they were offered most often). Results were consistent with previous research on alcohol preference: women selected more liquor and wine images, men selected more beer images; heavy episodic drinkers selected more beer and liquor images and selected fewer wine images than lighter drinkers and non-drinkers. In addition, IAT scores were sensitive to drinking levels in the expected direction and, importantly, were robust to stimuli selected. Thus, results provide initial validation of idiographic approaches to stimuli selection.

© 2012 Elsevier Ltd. All rights reserved.

1. Introduction

People differ in their drink(s) of choice. However, in research, it is common to rely on a standardized set of alcoholic beverage stimuli, which may not match participants’ actual drinking behavior. The current study evaluated stimuli selection using an implicit measure, and investigated how drinker status and gender were related to stimuli selection. Implicit measures of associations were used because they assess participants’ reactions to alcohol-related stimuli, are of considerable interest in the field, and tend to rely on standardized stimuli.

Implicit measures of associations are those in which the content and strength of an association in memory is inferred from a person’s behavior (typically, reaction times when categorizing stimuli) versus asking the person directly about how strongly constructs are related. Implicit measures appear to capture some aspects of responding outside conscious control and may be less susceptible to self-presentation; thus, they may be useful for explaining behaviors driven by impulsive, relatively uncontrolled, responding and/or that are embarrassing to report, including hazardous drinking (e.g., Roefs et al., 2011; Wiers et al., 2007). The present study relied on the Implicit Association Test (IAT: Greenwald, McGhee, & Schwartz, 1998), the most commonly used implicit measure of association.

Standardized stimuli are typically used to represent alcohol in implicit measures. This nomothetic approach includes using pictures or words to represent a single type of alcohol (e.g., beer: Lindgren, Neighbors, Ostaftin, Mullins, & George, 2009) or using pictures or words, each of which represents a different types of alcohol (e.g., the words “beer,” “wine,” and “whiskey”: Houben & Wiers, 2007). Because individuals may have different associations with specific types of alcohol, this approach could be an important explanatory factor for inconsistent results in the implicit alcohol literature (see Reich, Below, & Goldman, 2010; Roefs et al., 2011; Rooke, Hine, & Thorsteinsdson, 2008). An implicit measure that allows for idiographic stimuli selection could move the field forward by insuring that the measure reflects participants’ drinks of choice, thereby increasing the task’s personal relevance.

Stimuli selection was investigated in two idiographic IATs administered to undergraduate drinkers and non-drinkers. Differences in drink stimuli were examined as a function of gender and drinker status. Previous research suggests that male and female undergraduates differ in their alcohol preferences. For example, women report that they are more likely to drink liquor whereas men generally drink beer (Pedersen & LaBrie, 2007). Thus, corresponding gender differences in stimuli selection were expected. Similarly, heavy episodic drinkers (HEDs; those who consume four/five or more drinks on an occasion in the past 30 days for women/men) were expected to have different drink selections than lighter drinkers or non-drinkers. This expectation is consistent with findings that consuming beer or liquor was a risk factor for a recent drinking event meeting HED criteria and that consuming wine was a protective factor (Clapp & Shillington, 2001). Finally, whether IAT scores differed due to
stimuli selection was also investigated as a check that the IAT was robust to the influence of stimuli variability. Consistent with Lindgren et al. (2009), drinker status was expected to influence IAT scores (indicating the task’s known-groups validity), but no independent effect of drink choice was expected.

2. Method

2.1. Participants

Participants were 300 undergraduates (136 men, 164 women) between the ages of 18–25 (M = 20.47, SD = 1.52). Fifty-seven percent of participants were identified as White/Caucasian, 30% as Asian, 9% as multiracial, and the remaining 4% as either Black/African American, American Indian/Alaska Native, Native Hawaiian/other Pacific Islander, unknown, or declined to answer.

2.2. Measures

2.2.1. Implicit Association Test (IAT)

The IAT (Greenwald et al., 1998) is a reaction time measure. Participants classify stimuli in order to measure their relative association strengths between two sets of target and attribute categories (for a detailed description, see Lindgren et al., 2009). Classification is expected to be faster when the pairing of the target and attribute categories corresponds to participants’ associations in memory. Two IATs were used: the alcohol approach and the alcohol excitement IAT. Both IATs measured associations toward alcohol versus water. The alcohol approach IAT (see Ostafin & Palfai, 2006) used the contrasting attributes “approach” (stimuli: approach, closer, advance, forward, and toward) and “avoid” (stimuli: avoid, away, leave, withdraw, and escape). The alcohol excitement IAT used the attribute categories “excite” (stimuli: cheer, high, fun, amplify, and excite) and “depress” (stimuli: sedate, deplete, lessen, depress, and quiet). The IATs were scored such that higher scores indicated stronger associations with “alcohol” and “approach” (and “water” and “avoid”) and with “alcohol” and “excite” (and “water” and “depress”). Category pairings and IAT order were counterbalanced. Scores were calculated using the D score algorithm (Greenwald, Nosek, & Banaji, 2003).

Alcohol stimuli were selected by participants. They selected four images of alcoholic beverages (out of a total of 15; see Table 1). They selected images of that they consumed most often (non-drinkers selected images of what they were offered most often). Each image included three exemplars of a single alcohol category (e.g., three microbrews, three red wines). The images were developed from discussions with campus alcohol experts and undergraduates. Stimuli representing water were standardized. They consisted of four images, each with three exemplars.

2.2.2. Quantity/Frequency

The QF (Baer, 1993; Marlatt, Baer, & Larimer, 1995) is a 5-item measure that assesses peak and typical alcohol consumption levels within the last 30 days. The QF was used to determine drinker status.

2.3. Procedure

Procedures were approved of by the university’s Institutional Review Board. Participants were recruited by email and were invited to participate in a study about cognitive processes and alcohol. Study procedures, including informed consent, were completed in the laboratory. IATs and self-report questionnaires were presented in random order. Participants were compensated $30.1

---

1 The current study is part of a larger project aimed at validating implicit measures as predictors of alcohol problems, consumption, and cravings (see Lindgren et al., in press).

### Table 1

<table>
<thead>
<tr>
<th>Stimuli ranking</th>
<th>Non-drinkers (N)</th>
<th>Non-HEDs (N)</th>
<th>HEDs (N)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Iced malt beverages (52)</td>
<td>Hard alcohol (76)</td>
<td>Hard alcohol (272)</td>
</tr>
<tr>
<td>2</td>
<td>Red wine (51)</td>
<td>Iced malt beverages (70)</td>
<td>Keg beer (165)</td>
</tr>
<tr>
<td>3</td>
<td>Hard alcohol (45)</td>
<td>Cocktails (67)</td>
<td>Cocktails (153)</td>
</tr>
<tr>
<td>4</td>
<td>Cocktails (42)</td>
<td>Red wine (56)</td>
<td>Light macrobrew (126)</td>
</tr>
<tr>
<td>5</td>
<td>Imported beer (37)</td>
<td>Champagne (50)</td>
<td>Imported beer (115)</td>
</tr>
<tr>
<td>6</td>
<td>Champagne (37)</td>
<td>Imported beer (46)</td>
<td>Microbrew (111)</td>
</tr>
<tr>
<td>7</td>
<td>Light macrobrew (35)</td>
<td>Microbrew (34)</td>
<td>Iced malt beverages (110)</td>
</tr>
<tr>
<td>8</td>
<td>Keg beer (34)</td>
<td>White wine (34)</td>
<td>Red wine (87)</td>
</tr>
<tr>
<td>9</td>
<td>Macrobrew (23)</td>
<td>Light macrobrew (32)</td>
<td>White wine (62)</td>
</tr>
<tr>
<td>10</td>
<td>White wine (23)</td>
<td>Keg beer (27)</td>
<td>Trendy cheap beer (56)</td>
</tr>
<tr>
<td>11</td>
<td>Trendy cheap beer (17)</td>
<td>Trendy cheap beer (15)</td>
<td>Champagne (46)</td>
</tr>
<tr>
<td>12</td>
<td>Microbrew (15)</td>
<td>Macrobrew (12)</td>
<td>Macrobrew (40)</td>
</tr>
<tr>
<td>13</td>
<td>Iced light macrobrew (6)</td>
<td>Ultra light beer (7)</td>
<td>Malt liquor (22)</td>
</tr>
<tr>
<td>14</td>
<td>Ultra light beer (2)</td>
<td>Iced light macrobrew (4)</td>
<td>Ultra light beer (5)</td>
</tr>
<tr>
<td>15</td>
<td>Malt liquor (1)</td>
<td>Malt liquor (2)</td>
<td>Iced light macrobrew (2)</td>
</tr>
</tbody>
</table>

Wine composite

<table>
<thead>
<tr>
<th>Beer</th>
<th>2.06 (1.98)</th>
<th>2.60 (1.97)</th>
<th>1.10 (1.41)</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Liq肃 composite</th>
<th>3.13 (2.34)</th>
<th>2.60 (2.29)</th>
<th>3.48 (1.84)</th>
</tr>
</thead>
</table>

Note. Macrobrew refers to major (US) domestic beer brands. Non-HEDs = drinkers who do not meet heavy episodic drinking criteria (n = 68). HEDs = drinkers who meet heavy episodic drinking criteria (4/5 or more drinks per occasion for women/men; n = 178). Non-drinkers = participants who reported no alcohol consumption in the last 30 days (n = 54). Ns = number of participants who selected that image and are collapsed across the two study IATs. Participants were asked to select four images for each IAT. Composite variables represent the total number of images (across both IATs) selected by participants for that category of alcohol. Participants selected 8 images, 4 per IAT. Means and standard deviations for composites are reported.

3. Results

3.1. Stimuli selection

Frequencies were collapsed across the IATs because the pattern of results was nearly identical (see Table 1). Three composite variables were created. Frequencies of selecting red wine, white wine, or champagne were summed to create a composite wine variable. The same strategy was used to create beer and liquor composites. Iced malt beverages (e.g., lemonade-, citrus-, and other fruit-flavored malt beverages) frequencies were dichotomized; participants received a “1” for selecting the iced malt beverage at least once and “0” if they never selected the iced malt beverage image. The malt liquor image was dropped — it did not fit within the aforementioned categories and was rarely selected.

A 2 (gender) by 3 (drinker status: non-drinker, non-HED, and HED) multivariate analysis of variance (MANOVA) was used to test for differences in selecting beer, wine, and liquor images.2 Results indicated main effects of gender, F(3, 292) = 9.88, p < .001, and of drinker status, F(6, 584) = 6.09, p < .001. Women chose more wine and liquor (means = 1.83 and 2.38, respectively) than men (means = 1.07 and 1.95, respectively); men chose more beer (M = 4.05) than women (M = 2.53). Pairwise comparisons indicated that significant differences

2 Analyses were also conducted comparing the two largest racial groups in the sample — Asian Americans and Whites/Caucasians. No significant differences were observed with respect to stimuli selection or IAT scores.
in beer selection were found only between HEDs and non-HEDs, with HEDs selecting more beer images, \( p < .05 \). Significant differences in wine selection were observed between non-drinkers and HEDs, and between non-HEDs and HEDs, with HEDs selecting fewer wine images than either of the other two groups, \( ps < .01 \). For liquor, significant differences were found between non-drinkers and HEDs only, with HEDs selecting more liquor images than non-drinkers. The two-way gender by drinker status interaction was non-significant, \( F (6, 584) = 1.34, p > .05 \).

Binary logistic regression was used to test for differences in selecting iced malt beverages. Gender, drinker status, and the interaction were entered into the model as predictors simultaneously. The model was a good fit compared to an intercept only model, \( \chi^2 (4) = 29.83, p < .001 \). Results indicated significant main effects for the contrast comparing HEDs to non-drinkers and for gender, \( ps < .05 \), as well as their significant interaction, \( B = 1.37, SE = .05, odds ratio = 3.95, p < .05 \). Female non-drinkers were more likely to select iced malt beverages than female HEDs. Men were less likely to choose iced malt beverages in general (see Fig. 1).

3.2. IAT validation

IAT scores were examined as a function of drinker status using one-way ANOVAs for each IAT. Results indicated significant main effects for drinker status: Alcohol Approach: \( F (2, 285) = 4.85, p < .01 \); Alcohol Excitement: \( F (2, 284) = 9.05, p < .001 \). Participants reported higher levels of drinking as their IAT score increased, indicating they had stronger relative associations with alcohol and approach (vs. alcohol and avoid) and with alcohol and excite (vs. alcohol and depress). For the Alcohol Approach IAT, significant pairwise differences using Tukey’s HSD were observed only between non-drinkers (\( M = -.25, SD = .37 \)) and HEDs (\( M = -.10, SD = .35 \)). For the Alcohol Excitement IAT, non-drinkers (\( M = -.21, SD = .35 \)) had significantly lower scores than both non-HEDs (\( M = -.02, SD = .42 \)) and HEDs (\( M = .06, SD = .40 \)). Finally, whether IAT scores differed as a function of stimulus selection after controlling for consumption was tested. As expected, no significant differences were found (\( ps > .05 \)).

4. Discussion

Results were generally consistent with expectations and with previously reported findings about college student drink preferences and behavior (e.g., Clapp & Shillington, 2001; Pedersen & LaBrie, 2007). Both gender and drinker status differences in stimuli selection were observed. Men selected more beer images than women, and women selected more wine and liquor images. Additionally, HEDs were significantly more likely to select beer and liquor and less likely to select wine images. Finally, iced malt beverages – among the top two selections for non-drinkers and non-HEDs – were more likely to be chosen by female non-drinkers than by female HEDs or men. Finally, although stimuli selection varied, stimuli selection did not appear to influence IAT scores after controlling for participant alcohol consumption.

IAT scores did not differ as a function of selecting a particular type of drink image but did vary as a function of drinker status, supporting the validity of the idiographic IAT. This pattern suggests that the alcohol-related associations captured by the IAT are sensitive to differences in levels of drinking regardless of the types of images that individual participants select. This sensitivity is important. To the degree that researchers wish to make specific claims that they are measuring associations about what participants actually like to drink versus measuring more general associations about alcohol, they may be better off using idiographic variants of implicit measures. Moreover, an idiographic IAT may also help remove variability in findings due to extraneous factors, such as preferences and aversions, thereby creating a more sensitive measure of associations.

Future work should test whether variations in stimuli type affect the strength of the relations between the implicit measures and drinking outcomes, such as alcohol consumption and alcohol-related problems. Notably, Houben and Wiers (2007) found that a personalized IAT significantly predicted drinking outcomes but less so than a traditional (nomothetic) IAT. However, methodological differences between their study and the present one (e.g., Dutch vs. U.S. samples; IAT design differences) make it unclear whether their findings generalize with respect to the use of individualized IATs. Studies using idiographic IATs in non-alcohol domains are limited and findings are contradictory: one study found that an idiographic self-esteem IAT had stronger correlations with explicit measures than a standardized IAT (e.g., Greenwald & Farnham, 2000) and another study found that idiographic anxiety-related IATs and single-category IATs did not perform better than their standardized counterparts (e.g., Stieger, Göritz, & Burger, 2010). Further investigation should help identify under what conditions idiographic IATs will enhance predictive validity.

Study implications are constrained by the use of a single sample of university students. Findings are also limited by the specific stimuli that were used in the study – e.g., despite their popularity, energy drinks containing alcohol were not included because of concerns about confounding the alcohol category with stimulants. Despite these limitations, this study represents an important step toward validating idiographic approaches to stimuli selection and, ultimately, developing implicit measures that assess drinkers’ actual preferences.

Role of funding source

This research was supported by R00 AA017660. NIAAA 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

Dr. Lindgren designed the study, conducted the analyses, wrote the Results, abstract and parts of the Introduction and Discussion, and edited all sections of the manuscript. Ms. Westgate oversaw data collection, wrote the Method, and wrote part of the Introduction. Dr. Kilmer consulted on college student drinking preferences, assisted with stimuli development, and edited all sections of the manuscript. Dr. Kaysen wrote portions of the Discussion and edited all sections of the manuscript. Dr. Teachman collaborated on the study design, consulted on data analytic strategies, wrote a portion of the Introduction, and edited all sections of the manuscript. All authors have contributed to and approved the final manuscript.

Conflict of interest

All authors declare that they have no conflicts of interest.

References

