



# Approach–avoidance pattern of visual attention in hazardous drinkers with ambivalence



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## HIGHLIGHTS

- We compared hazardous drinkers with and without ambivalence toward alcohol.
- We examined visual attention in response to alcohol and control pictures.
- We monitored the eye movements of participants over time.
- Ambivalent hazardous drinkers tended to look at alcohol pictures and then avoid them.

## ARTICLE INFO

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## ABSTRACT

Ambivalence toward alcohol often develops when hazardous drinkers try to quit or to control their drinking. The purpose of this study was to investigate the differences between hazardous drinkers with and without ambivalence toward alcohol in terms of their visual attention to alcohol-related pictures over time using an eye-tracker. The study included 20 hazardous drinkers with ambivalence and 21 hazardous drinkers without ambivalence. The eye movements of the participants were monitored while the participants conducted a free-viewing task in which 20 pairs of alcohol-related pictures and matched control pictures were presented. The results showed that the hazardous drinkers with ambivalence were more attentive to the alcohol-related pictures at first and were more attentive to the control pictures toward the end of the task. On the other hand, the hazardous drinkers without ambivalence were more attentive to the alcohol-related pictures from beginning to end. The findings of this study indicated that ambivalence toward alcohol resulted in the inclination to approach and then avoid alcohol in a consecutive sequence. The present results could be helpful in distinguishing hazardous drinkers who may have ambivalence toward alcohol and identifying the pattern of ambivalence more concretely. Additionally, further studies need to consider the time that is important to measure ambivalence toward alcohol.

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## 1. Introduction

Individuals with ambivalence toward alcohol (AA) have both approach and avoidance inclinations to drinking alcohol (Breiner, Stritzke, & Lang, 1999). AA can be explained through the stages-of-change model, which consists of five stages: precontemplation, contemplation, preparation, action, and maintenance (Prochaska, DiClemente, & Norcross, 1992). The earliest stage of change is known as precontemplation in which there is no intention to change drinking

behavior. Contemplation describes a stage in which there is an interest in change but little commitment. Contemplators become more and more aware of the potential benefits of making a change, but the costs tend to stand out even more. They mull over the cost and benefit of quitting their alcohol consumption, and it makes them feel ambivalence (DiClemente & Prochaska, 1985). After resolving AA, they form an intention to change their drinking behavior in the preparation stage; this involves implementing a plan of action. In the maintenance stage, they continue their efforts to consolidate gains made in quitting alcohol (DiClemente & Velasquez, 2002; Prochaska & DiClemente, 1992). Considering the features of these stages, inducing AA may be helpful in motivating hazardous drinkers to change their drinking (e.g., promoting the transition from the precontemplation to the contemplation stage). At the same time, resolving AA may help those with AA to quit drinking or control their drinking behaviors (e.g., promoting the transition from the contemplation to the preparation stage). In either case, it is important to identify AA to stop or control the drinking of alcohol (Rollnick & Morgan, 1995).

*Abbreviations:* AA, Ambivalence toward alcohol; AMBI, Hazardous drinkers with ambivalence; NO-AMBI, Hazardous drinkers without ambivalence.

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Although many researchers have proposed that the approach and avoidance inclinations of AA occur simultaneously (e.g., Barkby, Dickson, Roper, & Field, 2012; Cacioppo, Gardner, & Berntson, 1999), it is possible that there is a timing difference between these inclinations that can be explained with the Reinforcement/Reprocessing model of Reflectivity ( $R^3$  model; Gladwin, Figner, Crone, & Wiers, 2011). The  $R^3$  model states that conditioning processes and learned associations exist at different levels, and these differences determine the speed of activation (Gladwin et al., 2011). Thus, a stronger association occurs more quickly than a weaker association. Given the association levels of the approach and avoidance inclinations of AA, the inclinations appear at different times (McEvoy, Stritzke, French, Lang, & Ketterman, 2004). The inclination to approach alcohol is assumed to develop through repeated cycles of drinking and consequent positive reinforcement (Robinson & Berridge, 2003). As a result, the inclination to approach alcohol arises quickly, reflexively, and automatically outside of conscious awareness (Breiner et al., 1999). On the other hand, the inclination to avoid alcohol is assumed to develop while considering quitting or controlling drinking (Wiers et al., 2007). Thus, the inclination to avoid alcohol may require conscious awareness and reflection on the advantages of being sober and the disadvantages of drinking (Cox, Fadardi, & Pothos, 2006). Given the features of both inclinations, the level of association between alcohol and positive consequences (i.e., the approach inclination) might be stronger than the level of association between alcohol and negative consequences (i.e., the avoidance inclination). Thus, it is possible that they occur consecutively (i.e., the automatic approach inclination occurs first, followed by the controlled avoidance inclination). Therefore, it seems necessary to investigate the relationship between AA (including both approach and avoidance inclinations) and time.

Examining visual attention during exposure to alcohol-related stimuli is one way to measure AA over time (Bradley, Mogg, & Millar, 2000). The approach inclination can be measured by focusing on attention, which reflects early, fast, automatic processes, and can be detected for short periods between 50 and 200 ms (Bradley, Mogg, Wright, & Field, 2003). On the other hand, the avoidance inclination can be measured by assessing attention that is maintained for a relatively long period of 1000 ms or longer, which reflects late, slow, conscious processes (Bradley et al., 2000; Field & Cox, 2008; Koster, Verschuere, Crombez, & Van Damme, 2005). Recently, researchers have increasingly used an eye-tracking system to measure visual attention more directly and continuously (Field & Cox, 2008). Specifically, several studies have examined visual attention by measuring eye movements using a free-viewing task (e.g., Bonitz & Gordon, 2008; Kang et al., 2012). In the free-viewing task, the participants are free to explore the field of the displayed stimuli; this task is useful in reflecting the participants' natural eye movements over time (Ipata, Gee, Goldberg, & Bisley, 2006). Therefore, the use of an eye-tracking system and a free-viewing task to examine AA may help to identify the time-based pattern of the approach and avoidance inclinations of AA.

The purpose of this study was to measure AA and determine whether it changes over time. To examine this issue, we investigated the differences between hazardous drinkers with and without AA in their visual attention to alcohol-related images using a free-viewing task and an eye-tracker. There were three hypotheses of the study. First, we expected that hazardous drinkers would be significantly more attentive (biased) to alcohol-related pictures than control pictures at first. However, we expected that the hazardous drinkers with AA would be significantly less attentive to the alcohol-related pictures over time than would those without AA. Second, we hypothesized that all hazardous drinkers would show a significantly shorter latency and longer initial fixation on alcohol-related pictures than on control pictures. Third, we hypothesized that hazardous drinkers with AA would have a significantly shorter dwell time and a lower total fixation count on alcohol-related pictures than would those without AA.

## 2. Method

### 2.1. Subjects

Three hundred seventy-eight undergraduates were recruited, and forty-one of them were identified as hazardous drinkers with and without ambivalence using the Alcohol Use Disorders Identification Test (AUDIT; Saunders, Aasland, Babor, de la Fuente, & Grant, 1993) and the ambivalence index of the Approach and Avoidance of Alcohol Questionnaire (AAAQ; McEvoy et al., 2004). The latter were divided into two groups: hazardous drinkers with ambivalence (AMBI,  $N = 20$ ) and hazardous drinkers without ambivalence (NO-AMBI,  $N = 21$ ). The AMBI group consisted of 9 males and 11 females, and the NO-AMBI group consisted of 11 males and 10 females. All participants were Korean.

### 2.2. Measures

#### 2.2.1. Drinking frequency and quantity

Drinking frequency was assessed using a seven-point Likert scale ranging from "once a month or less" (1) to "every day" (7). The participants also indicated the number of standard drinks that they typically consume per drinking occasion.

#### 2.2.2. Alcohol Use Disorders Identification Test

The AUDIT is a 10-item self-report questionnaire that screens for hazardous or harmful drinking (Saunders et al., 1993). The items measure the quantity and frequency of drinking and heavy drinking, symptoms of dependence, tolerance and alcohol-related negative consequences. The participants rated the items on a five-point Likert scale with total scores ranging from 0 to 40. The item scores are summed to provide an overall measure of drinking behavior, with higher scores indicating more harmful drinking (Saunders et al., 1993). An AUDIT score  $\geq 8$  produces 85% sensitivity and 89% specificity when used as a cut-off score for problem/hazardous/harmful drinking (Bush, Kivlahan, McDonell, Fihn, & Bradley, 1998; Cherpitel, 1995). The Korean version of the AUDIT has shown good internal consistency (Cronbach's  $\alpha = .89$ ) and criterion validity (Kim et al., 1999). In the present study, the internal consistency score (Cronbach's  $\alpha$ ) was .73.

#### 2.2.3. Approach and Avoidance of Alcohol Questionnaire

The Approach and Avoidance of Alcohol Questionnaire is a 14-item self-report tool that separately measures inclinations to drink and not to drink on a nine-point Likert scale ranging from "not at all" (0) to "very strongly" (8) (McEvoy et al., 2004). The approach subscale includes seven items with scores ranging from 0 to 56; a greater score indicates a greater desire to drink. The avoidance subscale includes seven items with scores ranging from 0 to 56; a greater score represents a stronger inclination not to drink. The participants were asked to consider each AAAQ item with reference to their disposition toward drinking over the previous week. We created an ambivalence index following Kaplan's (1972) formula that was generated from positive and negative judgments about something or someone. Specifically, ambivalence was calculated by halving two positive and negative judgments and subtracting the absolute difference between the two (Kaplan, 1972). We calculated approach and avoidance inclinations using the AAAQ instead of positive and negative judgments so that we could capture both judgments about alcohol and behavioral inclinations toward drinking (ambivalence = (approach + avoidance) / 2 - |approach - avoidance|). For example, if an individual has scores of 49 on both the approach and avoidance subscales, his/her ambivalence score is 49. If an individual has a score of 49 on the approach subscale and a score of 1 on the avoidance subscale, his/her ambivalence score is -23. Greater positive values indicate greater ambivalence scores (both approach and avoidance inclinations toward alcohol), and greater negative values indicate lower ambivalence (only an approach inclination toward alcohol). The Korean version of the AAAQ showed acceptable internal consistency (Cronbach's

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