Evaluative processing of verbal and nonverbal affective stimuli in alcohol dependence

Young-Chul Jung

Department of Medicine

The Graduate School, Yonsei University

Evaluative processing of verbal and nonverbal affective stimuli in alcohol dependence

Directed by Professor Kee Namkoong

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Young-Chul Jung

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This certifies that the Master's Thesis of Young-Chul Jung is approved.

Thesis Supervisor : Kee Namkoong

Jae-Jin Kim: Thesis Committee Member #1

Jeong-Hoon Kim: Thesis Committee Member #2

The Graduate School, Yonsei University

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ABSTRACT

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Young-Chul Jung

Department of Medicine
The Graduate School, Yonsei University

(*D*irected by Professor Kee Namkoong)

The purpose of the present study was to investigate the characteristics of evaluative processing in alcohol dependent patients. 30 abstinent alcoholics and 30 healthy controls performed an emotional discrimination task, that was consisted of four different conditions. The subjects were required to response according to their subjective feeling among 'positive', 'negative' or 'neither positive nor negative'. There were no significant differences between the two groups in congruent conditions, except for positive pictures. In combined incongruent condition, both group demonstrated a *negativity bias* pattern, however, there was no significant difference between the two groups. In neutral condition, the alcohol dependent group manifested a stronger *positivity offset* to neutral words and a weaker positivity offset to neutral pictures. Furthermore, the patient group showed a tendency to choose between 'positive' or 'negative', whereas the control group preferred to made a compromise response. Our results indicate that alcoholics are prone to make dichotomous responses in ambiguous situations.

Key words : Alcohol Dependence, Positivity Offset, Negativity Bias, Dichotomous Response

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I. INTRODUCTION

Recent studies have shown that alcoholics have deficits in affective processing[1,2,3]. Yet, there remain inconsistencies in findings of the presence and degree of the impairment and it is still being discussed how these deficits influence the development and course of alcohol dependence.

In searching for general principles of affective processing, Cacioppo et al.[4] advanced a model, named the Evaluative Space Model, in which positive and negative affective processes are assumed to result from different underlying substrates. The model further posits that positivity and negativity are characterized by distinct activation functions and that these activation functions manifest two affective asymmetries: the *positivity offset* and *negativity bias*. The *positivity offset* refers to a tendency for the positive system to respond more than the negative system when the evaluative input is weak or absent. The *negativity bias* refers to a tendency for the negative system to respond more intensely than the positive system when evaluative input increases. While positivity offset and negativity bias appears to describe the general functional properties of the affect system, recent studies have reported that individuals differ in the strength of their *positivity offset* and *negativity bias*. Individuals with stronger *positivity offset*

form more positive impression of targets described only by neutral information, while individuals with stronger *negativity bias* form even more negative impressions of targets described by negative information[5].

Our concern is to examine whether abstinent alcoholics demonstrate distinct affective processing, especially under conflicting or ambiguous situations. An important characteristic of alcoholism is that even after prolonged abstinence period, the risk to relapse, often precipitated by alcohol related cues, remains very high. Given that *positivity offset* serves by encouraging an approach tendency to neutral stimuli, whereas *negativity bias* serves by ensuring an alarm response to potentially harmful stimuli, we hypothesized that stronger *positivity offset* and weaker *negativity bias* contribute to the liability of developing and relapsing in alcohol dependence.

In order to assess the individual differences in the strength of *positivity offset* and *negativity bias*, we developed an emotional discriminations task, which succeed to elicit affective asymmetries in normal persons[6]. The visual stimuli of our task was composed of pairs of words or pictures, intended to examine the patterns of affective processing in both verbal and nonverbal affective stimuli. Although there have been studies reporting that alcoholics are impaired in interpreting nonverbal emotional cues and recognizing facial expression of emotion[1,2], there have been few studies to investigate the evaluative processing of verbal affective stimuli in alcohol dependence.

In addition, our emotional discriminations task was designed in order to explore whether abstinent alcoholics manifest dichotomous response patterns. Dichotomous thinking refers to the tendency to evaluate experiences in terms of mutually exclusive categories rather than to see experiences as falling along continuum, which likely leads to extreme emotional responses and extreme actions[7,8].

The purpose of the present study was to compare the strength of *positivity*

offset and *negativity bias* between alcohol dependent patients and gender- / age-matched healthy controls. We hypothesized that alcoholics would exhibit distinct affective processing, characterized by stronger *positivity offset* and weaker *negativity bias*. In addition, we anticipated that patients with alcohol dependence would demonstrate a tendency to make dichotomous responses to affective stimuli. The correlation between clinical characteristics and response profiles was investigated.

II. MATERIALS AND METHODS

1. Subjects

30 patients with alcohol dependence (20 men and 10 women) and 30 healthy volunteers (20 men and 10 women) participated in this study. All patients were recruited from the Severance Mental Health Hospital. Subjects who have been fully detoxified after a 2-week in-patient treatment program were included in the study. Participants with any past or present history of psychiatric illness, neurological illness or severe medial illness that could influence task performance were excluded.

After a complete description of the study was provided to the subjects, written informed consent was obtained. Our study was carried out under the guidelines for the use of human subjects established by the institutional review board at Severance Mental Health Hospital.

2. Stimulus Materials

Emotional stimulation was performed with pairs of words or pictures. The

visual stimuli were sequentially presented in the form of a juxtaposed pair of words or pictures, in a vertical array on an LCD monitor. The picture stimuli were developed by modifying pictures from the International Affective Picture System (IAPS)[9]. 40 different pictures (neutral, 20; negative, 10; and positive, 10) were used to form stimulation pairs for the behavioral tasks. The word stimuli were chosen from the 100 emotional words frequently used in Korea[10]. 42 different disyllables (neutral, 22; negative, 10; and positive, 10) were used for the behavioral tasks. The picture stimuli were displayed in the form of a pair of black and white quadrangles (7.0 cm high x 3.5cm long) on a black background and the word stimuli were longitudinally presented in the form of white disyllables (3.5 cm high x 1.4 cm long) on a black background, within a pair of boxes with the same size as the picture stimuli. (Figure 1)

The valences of each individual word and picture were evaluated by asking the subjects to rate the p1easantness of each stimulus, after completing the behavioral task. We used the valence dimension of the Self-Assessment Manikin (SAM) affective rating system[11], in which a graphic figure from frowning (corresponding to -4) to smiling (corresponding to +4)depicted the valence on a continuously varying 9-point scale.

3. Emotional discrimination task

Our emotional discrimination task consisted of four different conditions, according to the nature of the stimuli: (a) positive congruent condition; (b) negative congruent condition; (c) combined incongruent condition; (d) neutral condition. Each condition had a word set and a picture set, therefore the behavioral task was composed of eight different blocks. The sequence of the blocks was randomized. The emotional condition (positive, negative, combined) blocks were composed of 30 pairs of emotionally neutral words (or pictures) and

30 pairs of emotionally valenced words (or pictures). The neutral condition blocks were composed of 60 pairs of emotionally -neutral words (or pictures). Affective stimuli were presented as pairs of positive-positive valence in the positive congruent condition, negative-negative valence in the negative congruent condition, positive-negative valence in the combined incongruent condition and neutral-neutral in neutral conditions. The subjects responded by pressing 1 of 3 buttons depending upon the subjective feeling produced by the stimuli. The subjects were instructed to select between "positive" (right button) and "negative"(left button), but in case neither was corresponding, the subject could choose "neither positive nor negative" (middle button). The visual stimuli were projected for 2500ms at 500ms intervals with a total duration of 180 seconds for each block. All responses were automatically transferred to a computer file, which was then utilized for the calculation of the response percentage and reaction time.

Figure 1. Examples of affective stimulus. (a) A pair of words in the congruent positive condition: the left word means '*hope*' and the right word means *'love*'. (b) A pair of words in the congruent negative condition: the left word means '*murder*' and the right word means *'insult*'. (c) A pair of pictures in the combined incongruent condition. (d) A pairs of pictures in the neutral condition.

4. Assessment scales

A comprehensive psychiatric interview was performed for diagnostic confirmation and comorbidity evaluation, including all modules of the Structured Clinical Interview for DSM-IV[12]. In addition, the past and present alcohol use history was taken along with general demographic information. The following scales were assessed only in the alcohol-dependent participants.

A. Alcohol Dependence Scale (ADS)

The ADS provides a quantitative measure of the severity of alcohol dependence consistent with the concept of the alcohol dependence syndrome[13]. 25 items cover alcohol withdrawal symptoms, impaired control over drinking, awareness of a compulsion to drink, increased tolerance to alcohol, and salience of drinking-seeking behavior over the past 12-month period. The total score range from 0 to 47. A score of 9 or more is highly predictive of diagnosis of alcohol dependence.

B. Hamilton Depression Scale (HAM-D)

The HAM-D is a 21 item, interviewer-administered scale that measures the severity of depressive symptoms[14]. The total score range from 0 to 63. Scores ranging from 0-7 suggest no or minimal depression, 8-17 indicate mild depression, 18-25 indicate moderate depression and score of 26 or above suggest severe depression.

5. Statistical Analysis

Group comparisons of the mean valence scores of the words and pictures were performed using the unpaired two-tailed t-test. Repeated measures of analysis of variance were performed on the data (response rates and reaction times) of our emotional discrimination task with stimulus type (2 level) X emotional condition (4 level) as the within subject variables, and group (2 level) as the between group factor. Post-hoc multiple comparison test were carried out. Correlation analyses were performed among clinical characteristics (duration of illness, Alcohol dependence scale score, Hamilton depression scale score) and response profiles (response rates and reaction times) in the patient group.

The SPSS 11.5 package was used for statistical analysis.

III. RESULTS

1. Population characteristics

Table 1. summaries the population characteristics of the alcohol dependent patient group and healthy control group. The mean ages of alcohol dependent patient group and healthy control group were 38.2 years and 36.8 years,

Table 1. Population characteristics

Condition	Alcohol (n=30)		Control (n=30)		p
	Mean	SD	Mean	SD	
Age (yrs)	38.2	7.2	36.8	8.2	ns
Gender (M/F)	20/10		20/10		ns
Education(yrs)	14.1	2.4	14.9	1.7	ns
Duration of illness	9.7	6.7	-		
ADS[a] score	26.0	5.3	-		
HAM-D[b] score	2.1	2.8	-		

[a]: Alcohol Dependence Scale
[b]: Hamilton Depression Scale
ns: not significant

respectively. The difference in age between groups was not significant ($p>0.05$). The mean levels of educational achievement were 14.1 years and 14.9 years, respectively. The difference of educational achievement was not significant ($p>0.05$).

2. Mean valence score to verbal and nonverbal affective stimuli (Figure 2)

The alcohol dependent patient group and the healthy control group were able to appropriately categorize the pictures and words used in our task according to the emotional valence. There was no significant difference between the two groups in mean valence score to emotional stimuli of positive or negative valence (alcohol dependent patient group: positive word mean = 3.5 ± 0.7, positive picture mean = 2.9 ± 0.8, negative word mean = -3.4 ± 0.8, negative picture mean = -3.3 ± 0.7; healthy control group: positive word mean = 3.4 ±0.6, positive picture mean = 2.8 ± 0.9, negative word mean = -3.4 ± 0.6, negative picture mean = -3.3 ± 0.5). Within groups, the mean valence score to

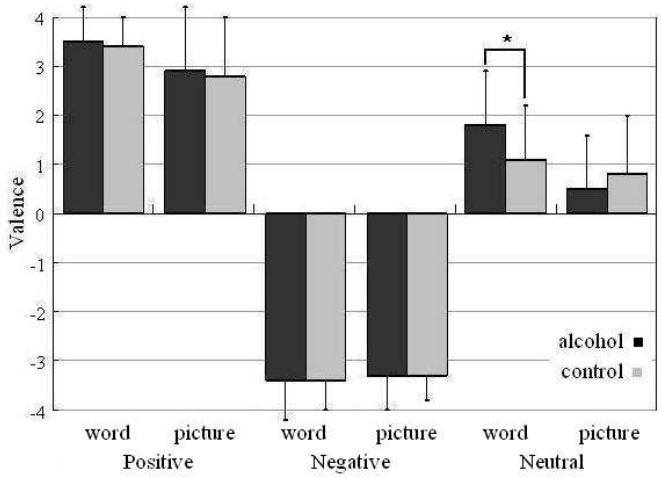

Figure 2. Comparison of mean valence scores of the words and pictures. There was no significant difference between the two group, except the neutral words, to which the alcohol dependent patient group rated significantly higher positive valence than the control group. (*: $p<.05$)

positive pictures was significantly lower than that to positive words in both groups. However, there was no significant difference between the mean valence score to negative pictures and that to negative words.

Both groups rated the neutral stimuli slightly positive rather than exactly neutral (alcohol dependent patient group: neutral word mean = 1.8 ± 1.1, neutral picture mean = 0.5 ±1.1; healthy control group: neutral word mean = 1.1 ± 1.1, neutral picture mean = 0.8 ± 1.2). Although, there was no difference between the two groups in mean valence score to neutral pictures (F =1.119, df=1, p=0.295), the mean valence score to neutral words was significantly higher in the alcohol dependent group (F = 4.046 df=1, p=0.049).

3. Reaction time in emotional discrimination task (Table 2)

There was no significant difference in the mean reaction time of the two groups, except the mean reaction time in positive congruent condition of words.

Table 2. Comparison of mean reaction time in each emotional condition

Stimulus	Condition	Alcohol		Control		F(1,58)	p
		Mean (ms)	SD	Mean(ms)	SD		
Word	Positive Congruent	1053.3	319.5	1029.1	304.7	0.135	ns
	Negative Congruent	1142.5	219.0	1051.2	303.5	0.090	ns
	Combined Incongruent	1347.4	216.9	1321.3	322.1	1.783	ns
	Neutral	1208.1	436.1	1123.6	436.6	0.563	ns
Picture	Positive Congruent	1141.6	258.1	1091.4	313.9	0.263	ns
	Negative Congruent	1081.9	179.7	1028.4	212.5	0.449	ns
	Combined Incongruent	1154.8	197.7	1122.9	277.7	1.112	ns
	Neutral	1175.5	291.4	1005.2	334.8	4.414	<.05

ns: not significant

The mean reaction time of alcohol dependent patient group were significantly delayed than that of the healthy control group (alcohol dependent patient group mean = 1175.5 ± 291.4%, healthy control group mean = 1005.2 ±334.8%)

4. Response rates in emotional discrimination task (Table 3., Figure 3.)

We defined the most common response of the healthy control group in each condition as the appropriate response. Thus, the '*positive*' response in positive congruent condition, the '*negative*' response in negative congruent condition, the '*negative*' response in combined incongruent condition was defined as the appropriate response. There was no significant difference between the '*positive*' response rate and '*neither positive nor negative*' response rate in neutral condition, and we defined the '*positive'* response as the appropriate response. Table 3 and figure 3. shows the response profile of the subjects in each condition.

A. Positive congruent condition

There was no significant difference of the appropriate response rate to positive words, however the appropriate response rate of alcohol dependent patient group was significantly lower than that of healthy control group to positive pictures ($p<.05$).

B. Negative congruent condition

Both group made responses appropriately and there was no significant difference between the two groups, neither to negative words nor to negative pictures.

Table 3. Comparison of response rate[a] in each emotional condition

Stimulus	Condition	Response	Alcohol		Control		F(1,58)	p
			Mean	SD	Mean	SD		
Word	Positive Congruent	Missing	2.1	5.0	0.1	0.6	4.578	<.05
		Positive	93.4	16.0	97.3	10.2	1.263	ns
		Negative	1.8	8.0	1.8	9.1	0.000	ns
		nPnN	2.7	14.0	0.8	4.3	0.501	ns
	Negative Congruent	Missing	1.7	4.3	0.1	0.6	3.913	ns
		Positive	0.2	1.2	1.8	9.9	0.863	ns
		Negative	91.6	24.8	96.7	17.3	0.866	ns
		nPnN	6.6	24.1	1.4	7.4	1.236	ns
	Combined Incongruent	Missing	4.0	11.3	1.6	3.5	1.281	ns
		Positive	22.3	33.0	10.2	13.8	3.449	ns
		Negative	54.2	39.0	55.2	34.7	0.011	ns
		nPnN	17.1	33.2	32.0	37.1	2.687	ns
	Neutral	Missing	1.1	3.2	0.8	1.7	0.261	ns
		Positive	76.1	26.8	52.4	43.3	6.487	<.05
		Negative	9.7	14.6	4.3	9.8	2.755	ns
		nPnN	13.1	25.8	42.0	44.3	9.531	<.05
Picture	Positive Congruent	Missing	0.9	2.8	0.8	2.3	0.029	ns
		Positive	85.3	24.3	95.3	12.5	4.026	<.05
		Negative	10.0	17.7	2.3	10.3	4.179	<.05
		nPnN	3.8	16.1	1.6	4.8	0.525	ns
	Negative Congruent	Missing	2.6	9.7	0.3	1.3	1.558	ns
		Positive	0.9	2.5	0.4	1.9	0.616	ns
		Negative	92.3	20.1	98.4	4.4	2.658	ns
		nPnN	4.2	18.4	0.8	2.6	1.304	ns
	Combined Incongruent	Missing	2.6	5.3	2.7	7.8	0.004	ns
		Positive	10.3	21.7	4.4	8.5	1.925	ns
		Negative	78.0	29.7	68.4	34.0	1.346	ns
		nPnN	9.1	24.6	24.4	36.0	3.706	ns
	Neutral	Missing	1.9	4.7	0.6	1.3	2.279	ns
		Positive	42.4	35.9	37.4	41.3	0.251	ns
		Negative	34.0	33.5	13.1	30.2	6.435	<.05
		nPnN	22.8	32.2	48.9	44.6	6.776	<.05

[a]: data are given as the mean percentage of responses
nPnN: neither positive nor negative
ns: not significant

C. Combined incongruent condition

The alcohol dependent patient group and the healthy control group shared a negative bias response pattern, i.e. the mean ‘negative’ response rate was

significantly higher than the mean ‘positive’ response rate, both to incongruent words and to incongruent pictures. However, there was no significant difference of the mean ‘negative’ response rate between the two groups. Besides the ‘negative’ response, the alcohol dependent patient group more likely made ‘positive’ responses to incongruent emotional stimuli, whereas the healthy control group preferred to respond as ‘neither Positive nor Negative (nPnN)’. However, there was no significant difference between the two groups.

D. Neutral condition

Although the alcohol dependent patient group and the healthy control group demonstrated a tendency to choose positive valence, there was a remarkable contrast between the two groups. Whereas, the healthy control group demonstrated a '*positivity offset*' pattern both to neutral words and to neutral pictures, the alcohol dependent patient group manifested a prominent '*positivity offset*' response pattern only to neutral words. The response pattern to neutral pictures did not reveal any preference for positive valence in alcohol dependent patients.

Besides, the alcohol dependent patient group preferred to choose between ‘*positive*’ or ‘*negative*’ in order to assign a valence for the neutral stimuli, while the healthy control group was prone to make a compromise response (‘*neither positive nor negative’*). Hence, the compromise response rate of the alcohol dependent patient group was significantly lower than that of the healthy control group, both to neutral words and to neutral pictures. More interestingly, there was a negative correlation between the positive response rate and compromise response rate in alcohol dependent patients, both to neutral words and neutral pictures (neutral words: pearson correlation=-.521, p=.003; neutral pictures: pearson correlation=-.816, p<.001). However, there was no significant correlation

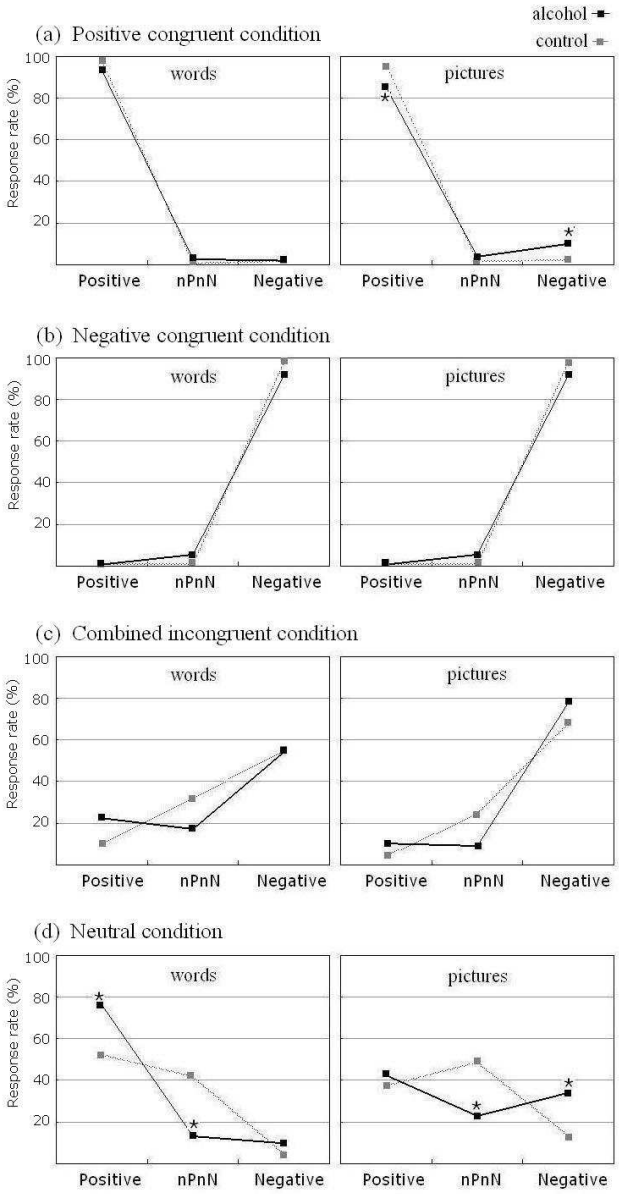

Figure 3. Comparison of response rate in each emotional condition.
Both group demonstrated a negativity bias response pattern in combined incongruent conditions (C) and a positivity offset response pattern in neutral conditions (D). Although, there was no significant difference in the strength of negativity bias, it is noteworthy that the alcohol dependent group manifested stronger positivity offset to neutral words, but weaker positivity offset to neutral pictures, compared to the healthy control group (D) (*: $p<.05$)

between the negative response rate and the compromise response rate (neutral words: Pearson correlation=-.229, p=.223; neutral pictures: Pearson correlation=-.360, p=.050).

E. Missing response rate in each emotional condition

There was no significant difference between the two groups in the missing response rate, except for the missing response rate in positive congruent conditions to positive words.

5. Interaction between stimulus type, emotional condition and group

In order to observe the significant interaction among the stimulus type (word and picture), emotional condition and group, we performed repeated measures analysis of variance. There were no significant interaction effects between stimulus type and group (F=0.700, df=1, p=0.375), or between emotional condition and group (F=2.794, df=2.311, p=0.057). In contrast, We found significant interaction effects between stimulus type and emotional condition (F=21.996, df=2.001, p<0.001).

6. Correlation between clinical characteristics and response profiles

When we analyzed the correlation among clinical characteristics (duration of illness, Alcohol dependence scale score, Hamilton depression scale score) and response profiles (appropriate response rate in each emotional condition), we did not find any significant correlation among these variables.

IV. DISCUSSION

This study has attempted to compare the evaluative processing between abstinent alcoholics and healthy controls by investigating the behavioral response pattern to verbal and nonverbal affective stimuli. We hypothesized that alcohol dependent subjects would exhibit distinct affective processing, characterized by stronger positivity offset and weaker negativity bias. According to our findings, the hypothesis was confirmed with respect to stronger 'positivity offset' to neutral words in the alcohol dependent patient group, however weaker negativity bias was not manifested. In addition, our findings revealed that the alcohol dependent patient group preferred to make dichotomous responses, while the healthy control group likely made compromise responses.

The difference in evaluative processing between the alcohol dependent patient group and the healthy control group was indicated not only in terms of *positivity offset* or *negativity bias*, but also in less complicated emotional conditions. When the emotionally valenced words (or pictures) were congruent, i.e., of the same valence, the healthy control group rarely made errors in assigning an accurate valence to the affective stimuli. In contrast, the alcohol dependent patient group showed impairments while evaluating positive pictures. Oscar-Berman and Schendan[15] reported asymmetries of brain function in alcoholics and proposed that the functions controlled by the right hemisphere are more vulnerable to alcohol-related brain damage than those related to the left hemisphere. The selective impairment in evaluative processing of words, sparing the evaluative processing of pictures, in positive congruent conditions, strongly supports the vulnerability of right hemisphere to alcohol-related damage.

However, it is noteworthy that the alcohol dependent patient group showed impairments in evaluative processing of positive pictures but not negative pictures. A number of previous studies have shown that alcoholics have deficits

in evaluating negative emotions such as anger and disgust[1,16]. In order to explain the discrepancy, we took account of the emotional intensity of the positive pictures. Considering that the absolute valence of positive pictures was rated significantly lower than that of negative pictures, when assessed individually, the emotional intensity of positive pictures should have been experienced as less intensive than the negative pictures. Taken together, we might assume that the deficits of alcohol dependent group in processing emotional stimuli are more evident, when the emotional intensity is weaker. Another finding of this study supports the above assumption. Although we hypothesized that the alcohol dependent patient group would demonstrate deficits in affective processing both in combined incongruent conditions and neutral conditions, significant differences were observed prominent in neutral conditions.

The neutral condition and was designed in order to compare the strength of positivity offset between alcohol dependent subjects and healthy controls. It is noteworthy that the alcohol dependent subjects manifested a stronger positivity offset pattern to neutral words, whereas the positivity offset pattern to neutral pictures were weaker, compared to healthy controls. Evaluating the emotional valence of words activate not only emotional processing but also semantic processing within the brain's distributed semantic system[17]. The distinct evaluative processing between verbal and nonverbal affective stimuli indicate that not only the emotional processing but also the semantic processing is affected in alcohol dependence.

Another characteristic difference between the two groups in evaluative processing was that the alcohol dependent patient group manifested a tendency to make dichotomous responses, while the control group preferred to choose compromise responses, in conflicting or ambiguous conditions. In contrast to congruent emotional conditions, there was no definite accurate response for either combined incongruent conditions or neutral conditions. As the stimuli in our

emotional discrimination task were composed of a pair of emotional words (or pictures), the participants not only had to appraisal the emotional information of each individual word (or picture), but also had to integrate them in order to make an accurate response. In this case, combined incongruent conditions or neutral conditions should have required additional cognitive effort for integrative processes. Considering that there were no significant differences between the two groups in mean valence scores when the words (or pictures) were presented individually, it might be assumed that the impairment in evaluating processing is largely attributed to the integrative processes of emotional information rather than the appraisal stage of emotional valence. A finding from our previous study might complement this assumption. Using the same emotional discrimination task, we reported that the dorsolateral prefrontal cortex was involved in the integrative processing during combined incongruent or neutral conditions[6]. The dorsolateral prefrontal cortex has been postulated to be involved in the functional integration of emotion and cognition, whereas conscious and voluntary emotional regulation occurs[20]. Given that the prefrontal cortex has been reported to be especially vulnerable to chronic alcohol consumption[21], our study might provide a hint of how the impairment of regulating brain circuits might contribute to the liability of relapse in alcoholism. As the integrative processes of emotional information are impaired, the alcohol dependent patients find difficulty in managing conflicting or ambiguous situations and are prone to make dichotomous judgments rather than to make a compromise. Recently, there have been some attempts to investigate the protective role of regulating brain circuits, including the lateral prefrontal cortex, against alcoholism[22] and it seems reasonable to presume that alcohol-related damage of these regulating brain circuits should be associated with the increased tendency to make dichotomous responses.

The fact that compromised response rate demonstrated a negative correlation with positive response rate indicates that the tendency to make dichotomous

response likely attribute to a stronger positivity offset in alcohol dependent patients. While positivity offset and negativity bias appear to manifest the general functional properties of the underlying positive and negative evaluative systems, we may propose that a stronger positivity offset of alcohol dependent patients are linked with the stronger activation function of positive evaluative system. However, it should be emphasized that the term stronger 'positivity offset' does not always connote higher 'positive affectivity'. The term 'positivity offset' should be interpreted from the perspective which conceives positive-negative valences as incentive values for approach-avoidance behavioral tendencies. With regard with the association between evaluative processes and behavioral tendencies, risk-taking behavioral tendencies might be conceptualized as a function of positivity offset and negativity bias. For example, individuals with strong positivity offset and weak negativity bias as risk-takers, whereas individuals with weak strong positivity offset and strong negativity bias as risk-avoiders[18,19]. Seen from this point of view, our findings indicate the risk-prone behavioral tendencies of alcohol dependent patients, which might underlie the chronic relapsing course of alcohol dependence. It is beyond our knowledge, whether these tendencies precede the development of alcohol dependence and whether varies among different types of alcohol dependence and further studies should be followed.

In the present study, there was no correlation between the depression scale score and response profile. Although affect should be an important antecedent of evaluation, previous studies did not report a strong correlation between depression and impairment of affective processing in alcoholism[23]. Probably, two interpretations are admitted. First, patients with comorbidity of major depression were ruled out and thus only patients with sub-clinical depressive symptoms were included. Therefore the severity of depressive symptoms was likely too mild to influence the evaluative processing of alcohol dependent patients. Second,

as mentioned above, the impairment in evaluating processing was proposed to be largely attributed to the integrative cognitive processes rather than the appraisal of emotional valence.

There are some limitations in our study. First, alcohol dependence is a heterogeneous condition and alcoholics differ significantly according to their personality characteristics. Although they were grouped as a whole in our study, probably different response patterns might be revealed when divided into subgroups according to alcoholism subtypes or gender. It should be explored whether our findings are valid only for subtypes that have been reported to exhibit low harm avoidance and high novelty seeking[24]. Meanwhile, the absence of correlation between clinical characteristics and the response profile might be due to the heterogeneity of the alcohol dependent group. Second, the alcohol dependent subjects were recruited after a 2~4 week detoxification period and therefore it is possible that the observed findings were partially influenced by residual withdrawal symptoms. The evaluative processing of alcoholics in prolonged stages of abstinence should be investigated. Third, the arousal component of affective stimuli was not considered in our study. Especially, the possibility of a confounding effect of the arousal component on the dichotomous response patterns should be examined in further studies.

V. CONCLUSION

The alcohol dependent patients show a distinct evaluative processing to verbal and nonverbal affective stimuli in various emotional conditions. The deficits of alcohol dependent subjects were manifested during a emotional discrimination task, in which the affective stimuli were presented as pairs of words or pictures, and thus the impairment in evaluating processing should be

largely attributed to the integrative processes of emotional information rather than the appraisal of emotional valence. The significant difference between alcohol dependent patients and healthy controls were most prominent in neutral conditions, where the alcohol dependent patients manifested a stronger positivity offset to neutral words and a weaker positivity offset to neutral pictures. In addition, we found that the alcohol dependent patients preferred to make dichotomous responses, while the healthy control group likely made compromise responses.

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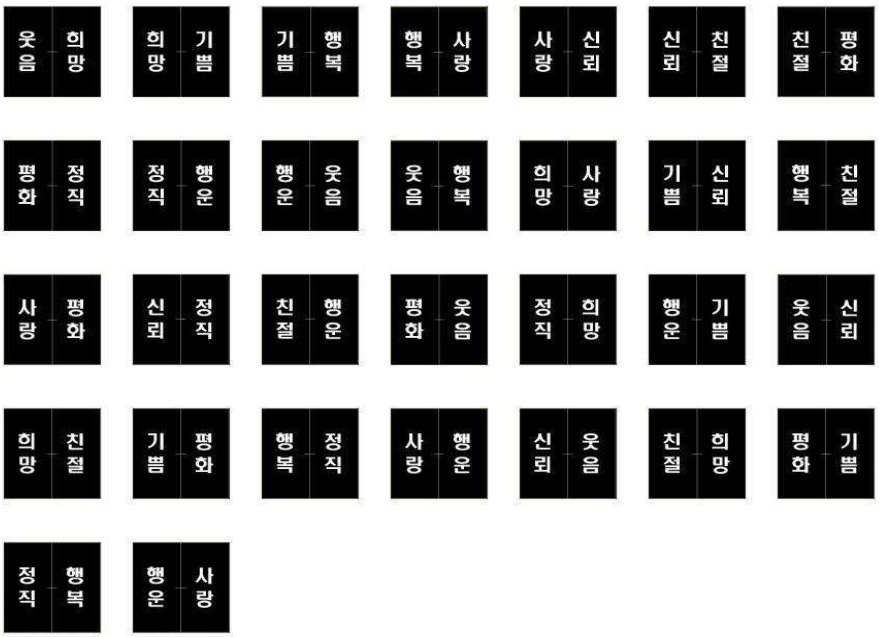
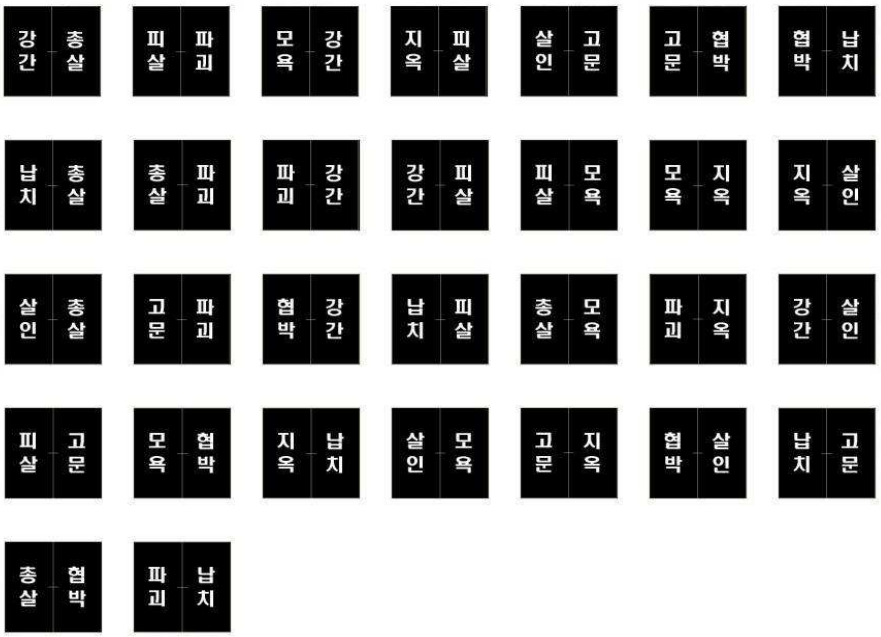
Appendix A. Verbal affective stimuli used in our emotional discrimination task

(a) positive congruent condition

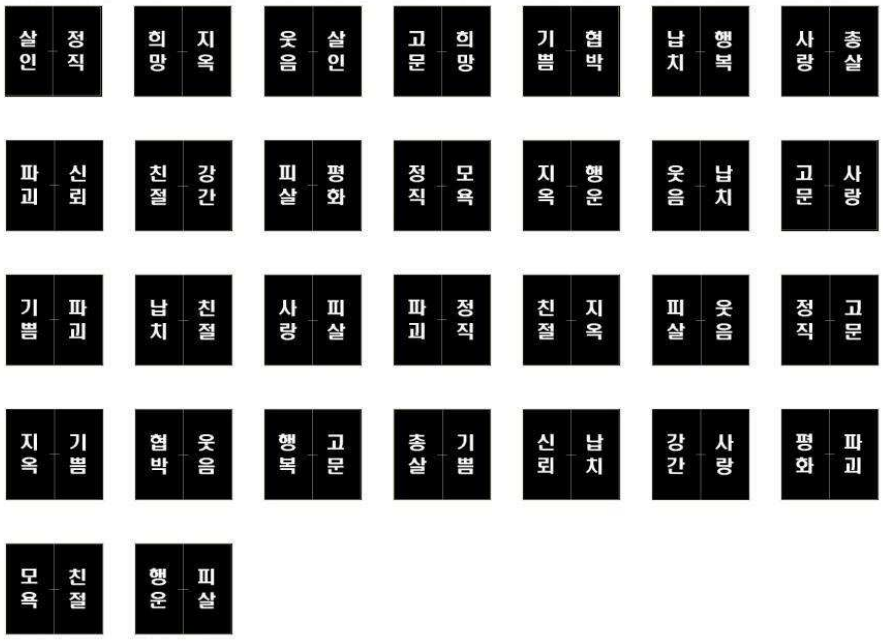


(b) negative congruent condition



Appendix A. Verbal affective stimuli used in our emotional discrimination task

(c) combined incongruent condition



(d) neutral condition

Appendix B. Nonverbal affective stimuli used in our emotional discrimination task

(a) positive congruent condition

(b) negative congruent condition

Appendix B. Nonverbal affective stimuli used in our emotional discrimination task

(c) combined incongruent condition

(d) neutral condition

알코올 의존 환자에서 언어적 비언어적 정서자극의 평가

<지도교수 남 궁 기>

연세대학교 대학원 의학과

정 영 철

본 연구의 목적은 알코올 의존 환자에서 언어적 및 비언어적 정서자극을 어떻게 평가하고 처리하는지를 분석하기 위함이다. 이를 위하여 알코올 의존 환자군과 정상 대조군 각각 30명씩을 대상으로 정서분별과제를 시행하였다. 정서분별과제는 다양한 정서가(valence)를 가지고 있는 단어쌍 혹은 그림쌍을 제시하고, 각각의 자극에 대해서 '긍정적인 느낌이다', '부정적인 느낌이다', '긍정도 부정도 아닌 느낌이다' 중에서 반응을 하도록 하였다.

본 연구의 결과는 다음과 같다.

1. 단어쌍 혹은 그림쌍의 정서가가 일치하는 경우 - 긍정 그림을 제외하고 - 두 군 사이에는 유의미한 차이가 없었다.

2. 단어쌍 혹은 그림쌍의 정서가가 긍정과 부정이 복합적으로 존재하는 경우, 알코올 의존 환자군 및 정상 대조군 모두 자극을 부정적으로 평가하는 경향(부정적 편향)이 강했으나, 두 군 사이의 유의미한 차이는 없었다.

3. 단어쌍 혹은 그림쌍의 정서가가 중립으로만 이루어진 경우, 정상 대조군은 자극의 종류에 상관없이 긍정적으로 평가하는 경향(긍정적 편향)이 있었지만, 알코올 의존 환자군은 단어쌍에 대해서만 강한 긍정적 편향을 보였다.

4. 단어쌍 혹은 그림쌍의 정서가가 중립적인 경우, 알코올 의존 환자는 긍정 혹은 부정 중에 하나를 선택하는 이분법적인 반응을 보이는데 반해, 정상 대조군은 절충적인 반응을 보이는 경향이 강했다.

이상의 결과는 알코올 의존 환자가 언어적 및 비언어적 정서 자극을 처리하는데 있어 정상인에 비해 이분법적인 반응을 보이는 경향이 있으며, 특히 중성 단어쌍은 긍정적으로, 중성 그림쌍은 부정적으로 평가하는 경향이 있음을 시사하고 있다.

핵심되는 말 : 알코올 의존, 긍정적 편향, 부정적 편향, 이분법적인 반응