

## Differential Reactivity of Attention Biases in Patients with Social Anxiety Disorder

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### ABSTRACT

Information-processing biases based on cognitive and cognitive behavioral models have been reported in social anxiety disorder (SAD). One such bias is the attention bias, or selectively attending to threat stimuli. This bias has been associated in anxiety with maintenance and worsening of SAD symptoms. The objective of the present study was to examine, compare, and clarify differences in attention biases to language stimuli between SAD patients and healthy people. Results indicated, no differences between the two groups, but differences were seen in the attention bias score among SAD patients. This suggests that there is an increased threat effect among SAD patients triggered by their attention bias toward social threat stimuli.

*Key words:* social anxiety disorder, attention, cognitive biases.

#### *Novelty and Significance*

*What is already known about the topic?*

- Previous SAD studies revealed that attentional bias has the effect on the maintenance of SAD symptoms.
- Some studies suggested that the high social individuals in Japanese showed more approach responses in dot-probe tasks.

*What this paper adds?*

- The differences in attention bias scores observed in this study suggest the need to consider differences in responses toward each stimulus word when detecting biases.
- Results showed basic information about attentional bias of the Japanese patients with SAD suggesting some clinical implication.

Information-processing biases based on the cognitive and cognitive behavioral models have been reported in social anxiety disorder (SAD). Examples include biases regarding the interpretation, memory, attention, and underlying causes. Attention bias in anxiety is selectively attending to threat stimuli. This bias has been associated with maintenance and worsening of SAD symptoms. To assess and examine the functions of attention bias, tests such as the dot-probe paradigm and modified Stroop task have been used. Studies have indicated that SAD patients demonstrate both avoidance and

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approach responses. Cognitive models and cognitive behavioral models have been developed for each anxiety disorder.

Studies have indicated that individuals with a high level of trait anxiety are more likely to selectively attend to threat stimuli. For example, attentions of SAD patients and individuals with high social anxiety traits are directed toward social threat stimuli (Mathews & Macleod, 1994). Also, Wells and Mathews (1994) suggested that the balance between self-focused attention and attention toward external elements is important in socially interactive situations. Excessive self-directed attention makes individuals perceive themselves as a social subject and leads to increased SAD symptoms.

The modified Stroop task has been used in a number of studies. The Stroop effect is a delayed response that occurs when the name of a color is indicated in a different color from the one described in the word (for example, when the word blue is written in red), due to an interference effect between the color and the word (Stroop, 1935). The modified Stroop task examines the function of attention by comparing different response times for colored threat words and neutral words. For instance, studies reported that SAD patients took longer to respond with the colors of negative evaluation words than neutral words and physical threat words (Hope, Rapee, Heimberg, & Dombeck, 1990; Mattia, Heimberg, & Hope, 1993; McNeil, Reis, Taylor, *et al.*, 1995). These extended response times are considered as evidence of cognitive avoidance. However, it is important to carefully interpret the results of the Stroop task, because individuals take longer to respond due to the effort demanded by the task, and their avoidance response to the stimuli (Bögels & Mansell, 2004).

Because of the above considerations, the dot-probe task is also used to examine attention. The dot-probe task requires individuals to quickly and correctly type the side where a dot appears after a neutral stimulus and a threat stimulus are presented. Asmundson and Stein (1994) reported that SAD patients responded more sensitively to social threat words. Musa, Lepine, Clark, Mansell, and Ehlers (2003) showed that a SAD group was more sensitive to social threat words, compared to a SAD and mood disorder combined group and a healthy group, and those with no manic-depressive disorder had more sensitive responses to social threat. Also, it has been suggested that socially anxious individuals are more likely to selectively attend to angry faces compared to a low social anxious group (Roelofs, Putman, Schouten, Lange, Volman, & Rinck, 2010). On the other hand, Mansell, Clark, Ehlers, and Chen (1999) showed that individuals with high social anxiety avoid both positive and negative faces during a speech-task. It has also been indicated that SAD patients avoid evaluative faces, regardless of social threat, or non-threat situations (Chen, Ehlers, Clark, & Mansell, 2002). According to the vigilance-avoidance hypothesis, such avoidance responses could be displayed from stimuli, after selective attention to threat stimuli (Mogg, Bradley, de Bono, & Painter, 1997; Williams, Watts, MacLeod, & Mathews, 1988). For example, Bögels and Mansell (2004) showed that when stimuli were presented between 250 to 500 ms, an approach response was common, but avoidance responses appeared between 500 to 1,000 ms. As a result, both approach and avoidance responses were observed. However, it is necessary to take into consideration the differences in tasks, stimuli, and the length of stimuli presentation, among others, when interpreting these responses. An intervention

study in which individuals were trained to pay attention to positive faces showed that it was effective in reducing anxiety in interpersonal interactions (Li, Tan, & Qian, 2008). Amir, Weber, Beard, Bomeya, and Taylor (2008) indicated that the implementation of an attention modification program reduced attention bias and alleviated anxiety during a speech task among individuals with high social anxiety.

In Japan, Matsumoto, Shiotani, Imaruoka, Sawada, and Ohmi (2009) examined the effects of social anxiety on attention blinks toward threat words. Moreover, Fujihara and Iwanaga (2008) examined the process of attention in anxiety. However, little has been reported on attention bias in SAD patients, and therefore difference between SAD patients and healthy individuals remain unclear.

Tests such as dot-probe task and modified Stroop task have been used to assess and examine the functions of attention biases. It has been demonstrated that SAD patients show avoidance and approach responses depending on the conditions of stimuli presentation. The present study aims to examine, compare and elucidate the differences in attention biases toward language stimuli between a SAD group and a healthy group.

## METHOD

### *Participants*

We conducted the dot-probe task with a group of 18 SAD patients (12 women) who agreed to participate in the survey and a control group of 17 undergraduate students (10 women). The SAD patient group worked on the task prior to a cognitive behavior therapy program. Participants were paid ¥1000 on completion of the survey.

### *Instruments*

- *Liebowitz Social Anxiety Scale (LSAS)*. We used the Japanese version of the Liebowitz Social Anxiety Scale (LSAS: Asakura, Inoue, Sasaki, *et al.*, 2002) to assess the level of anxiety and avoidance in social situations. The Japanese version of the LSAS has high internal consistency, test-retest reliability, and convergent validity and has been used as a clinical rating scale for SAD patients (Asakura *et al.*, 2002). The LSAS is composed of 24 items that are rated on a 4-point scale. A higher total score indicates a higher level of anxiety and avoidance in social situations.
- *Perceived Anxiety Control (PAC)*. We used the Perceived Anxiety Control scale (PAC: Shirotaki, Kodama, Nomura, & Adachi, 2013) to assess perceived anxiety control. The PAC is comprised of 14 items and each item is rated on a 5-point scale ranging from 1 to 5. The scale comprises three factors: avoidance, calm, and desire. Shirotaki *et al.* (2013) has demonstrated the reliability and validity of the scale. We reversed the total score for Factor 1 (avoidance) and Factor 2 (desire) such that higher scores indicated a higher level of perceived anxiety control. Shirotaki *et al.* (2013) have reported the clinical validity of PAC in addition to its high internal consistency and criteria validity.

### *Procedure*

The research ethics committees of the institutions to which the authors were affiliated approved this study. We also obtained the written informed consent of the participants before commencing the study and participants participated in the study after signing an agreement form.

We conducted the dot-probe task with each participant. After presenting a masked stimulus for 500 ms, a pair of a neutral words and a threat word was presented for 500 ms on the left and right of the screen. After the pair of words disappears, a dot was presented either on the left or the right of the screen. Participants were instructed to press the enter button as quickly as possible after the dot was presented. Pairs of words and dots were presented randomly (see Figure 1). We choose pairs of words from the word list developed by Helfinstein, White, Bar-Haim, Nathan, and Fox (2009), which was translated to Japanese in present study. The words lists were looked over and validated the accuracy by the TEXT Co., which is the experts of English editing service. Language stimuli consisted of pairs of 64 neutral, and 64 social threat words. SuperLab version 4.5 was used for task presentation. Each word was presented using a black, 36-point, MS Gothic font in parallel on a white background. Incorrect responses and procedures before and after the task were excluded from the analysis.

### *Data Analysis*

We conducted a t-tests to compare the response times for the scale and the attention task between the two groups. SPSS 16.0 was used for the analysis.

## RESULTS

Results are shown in Table 1. In the table, N indicates response times for neutral words and T the response times for threat words. Attention bias scores were calculated as differences in response times between N and T stimuli. The attention bias scores are indicated as N-T. It can be seen from the table that scores of the SAD group were significantly higher for each scale. Response times in the dot-probe task indicated no significant differences between T and N words. In contrast, attention bias scores indicated that the response times of the SAD group were significantly higher, suggestive of an approach response towards threat words.

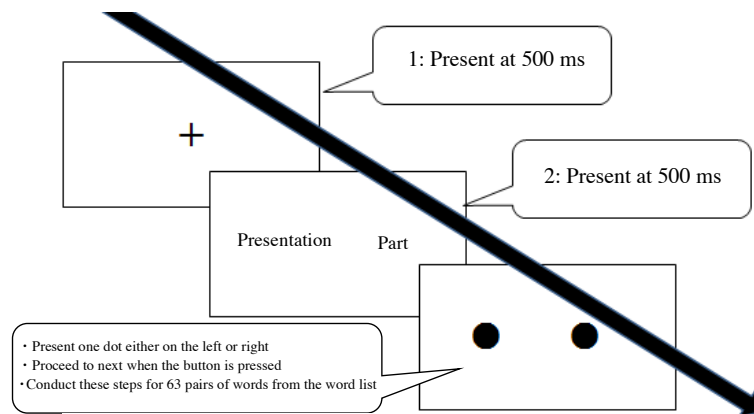


Figure 1. Flow of the dot-probe task. (Steps 1-3 were presented on a PC screen in order).

Table 1. Descriptive values and *t*-tests of each value.

	Control group		SAD group		<i>t</i> -values
	<i>(n</i> = 17; 10 female)		<i>(n</i> = 18; 12 female)		
	Mean	<i>SD</i>	Mean	<i>SD</i>	
LSAS-Fear	33.47	12.92	44.22	14.00	2.36*
LSAS-Avoid	22.88	14.54	37.78	13.29	3.17**
LSAS	56.35	25.52	82.00	26.12	2.94**
PAC	35.94	8.39	27.56	6.33	3.35**
Age	21.18	1.24	31.17	8.59	4.75**
N	477.10	68.14	546.37	154.42	1.70
T	479.61	67.28	524.57	145.27	1.16
N-T	-2.50	18.51	21.79	38.13	2.38*

Notes: \* =  $p < .01$ ; \*\* =  $p < .05$ ; N= Response times for neutral words; T= Response times for threat words; N-T= Attention bias scores.

## DISCUSSION

The objective of the present study was to examine, compare, and clarify different attention biases to language stimuli between a group of SAD patients and a healthy group. Results indicated no differences between the groups, but differences were confirmed in the attention bias score among SAD patients. This suggested that there is an increased threat effect in the threat among SAD patients, triggered by attention bias toward social threat stimuli. Comparison between the scales indicated that the scores of the SAD group were significantly higher. Therefore, we assumed that SAD outpatients who participated in this study had high SAD traits. Results of the dot-probe task indicated no differences in responses to each stimulus between SAD and healthy groups. In contrast, there were approach responses toward threat words in the SAD group, as observed by N-T scores. Although conventional studies have found differences in the 500 ms range, regardless of approach or avoidance responses, the present study found no differences in the type of word stimuli. It is possible that as with previous studies, there were no clear results, because the length of time for detecting attention biases was ambiguous. In contrast, differences in attention bias caused by the type of word stimulus were more likely to be observed in the SAD group. More specifically, SAD group showed shorter response times toward threat words and demonstrated different responses depending on the type of stimulus. Based on the review by Heinrichs and Hofmann (2001), we inferred that examining attention bias by using word stimuli as in the present study could tap internal thoughts. We conclude that SAD patients are highly sensitive in internal processing of threat stimuli, and are more likely to attend to threat stimuli. The differences in attention bias scores observed in this study suggest the need to consider differences in responses toward each stimulus word when detecting biases.

There are certain limitations to this study. The first is that although we compared SAD patients and a healthy group, there was a significant difference in age between the two groups, because the SAD group comprised outpatients including adults and the healthy group comprised undergraduates. Therefore, it is suggested that future studies should choose participants with homogeneous characteristics. Another limitation is the

relationship between biases, because this study was a basic study designed to examine attention biases. It is suggested that future studies should conduct detailed investigations of attention functions, such as conducting the task after evoking social anxiety, by combining different types of stimuli such as facial stimuli, and by comparing the length of presentation times. The final limitation of this study concerns changes triggered by the intervention. There is a lack of data on attention bias changes in Japanese people, and therefore it is important to consider changes in biases before and after medical treatment.

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