

Does visual scanpath reflect self-focused and other-focused attention, a maintenance factor of social anxiety?

Nozomi Tomita ^a, Ayumi Minamide ^b, and Hiroaki Kumano ^a

^a Faculty of Human Sciences, Waseda University, Saitama, Japan

^b Graduate School of Human Sciences, Waseda University, Saitama, Japan

Abstract

Introduction : Social anxiety disorder has two critical attentional processes, self-focused attention (SFA) and other-focused attention (OFA). These biases are caused by two psychological aspects: Strategies known as positive metacognitive beliefs and negative metacognitive beliefs. A method in which the occurrence of OFA is predicted by eye movement has been proposed. However, few studies have investigated the relationship between SFA and changes of eye movement. The relationship between the degree of SFA and OFA during speech and eye movements was investigated in this study, based on the psychosomatic relationship in which eye movements reflect psychological changes.

Methods : 40 student subjects completed the Metacognition about Focused Attention in Social Anxiety Questionnaire (MFAQ; Tomita & Kumano, 2016) that measured metacognitive beliefs about SFA and OFA and the Japanese version of Short Fear of Negative Evaluation Scale (SFNE; Sasagawa et al., 2004) that measured fear of negative evaluation. Thereafter, they underwent speech tasks. During speech tasks, the participant's eye movements were tracked. After speech task, the participant evaluated the subjective degree of SFA and OFA during speech using the Focused Attention Scale (FAS; Yamada et al., 2002) and Mental Perspective Scale for SAD (MPS; Tomita et al., 2018). Correlation analysis was performed between the scanpath during the speech tasks, the number of eye movements, SFA, OFA, and the metacognitive belief that controls both. Written informed consent was obtained from all participants.

Results : The scanpath revealed a weak negative correlation between FAS-self-focused, MPS-observer perspective, positive metacognitive beliefs about SFA, and negative metacognitive beliefs about OFA. On the other hand, the number of eye movements revealed a significant, moderately positive correlation with negative metacognitive beliefs about OFA.

Discussion : The results revealed that those who exercised SFA during the speech tasks and those who had high positive metacognitive beliefs about SFA had shorter scanpaths; thus, they moved their eyes less. Furthermore, these relationships were not shown for OFA. The possibility that SFA can be captured independently by measuring the scanpath was suggested. The number of movements may predict OFA rather than SFA because the number of movements was not related to SFA and was only significantly correlated with negative metacognitive beliefs about OFA.

Key words: Social anxiety disorder; Self-focused attention; Attention bias; Eye-tracking

Introduction

Social anxiety disorder (SAD) is characterized by a marked fear of social and performance situations in which the individual is scrutinized by others (American Psychiatric Association, 2013). Cognitive-behavioral models of social anxiety posit that attentional bias toward social threats is central to social fear (Clark & Wells, 1995; Rapee & Heimberg, 1997). Two critical attentional processes have been identified: Self-focused attention (SFA), which involves attending to inner cues like negative thoughts, negative self-imagery, and bodily sensations, and other-focused attention (OFA), which entails attending to environmental threats such as others' negative evaluations. Individuals with social anxiety pay attention to their appearance and behavior and the task at hand as well as monitor external threats simultaneously, which may result in poor performance. Furthermore, these biases are caused by two psychological aspects. First, strategies known as positive metacognitive beliefs entail believing that attending to people's reactions are beneficial for improving performance. Second, negative metacognitive beliefs involve thoughts such as believing one cannot control paying attention to oneself (e.g., Wells, 2007).

In order to improve social anxiety symptoms, it is imperative to assess the degree of SFA and OFA in daily life separately. A method in which the occurrence of OFA is predicted by eye movement has been proposed. It is based on the notion of psychosomatic relationship in which psychological issues such as metacognitive beliefs affect attention control and physiological changes such as eye movements. However, few studies have investigated the relationship between SFA and changes of eye movement because the subject of attention in SFA is the *self*, which is not captured as a visual stimulus. However,

it is possible that SFA can be predicted from eye movements by focusing on how one is looking, for example, the line of sight moving back and forth rather than on who one is looking at it. The relationship between the degree of SFA and OFA during speech and eye movements was investigated in this study, based on the psychosomatic relationship in which eye movements reflect psychological changes.

Methods

Subjects: We recruited 40 adults (24 women, 16 men), aged (Mean \pm SD) 19.60 ± 0.87 , to participate in the experiment. Written informed consent was obtained from all participants.

Measurements:

- 1) Focused Attention Scale (FAS; Yamada et al., 2002): The FAS consists of two subscales: FAS-self, which measures the degree to which participants attend to their body sensations, and FAS-others, which measures the degree to which participants attend to the behavior of others. We employed the FAS to measure the subjective degree of SFA and OFA during a speech task.
- 2) Mental Perspective Scale for SAD (MPS; Tomita et al., 2018): The MPS comprises three subscales: Field perspective (MPS-F), observer perspective (MPS-O), and detached mindfulness perspective (MPS-DM). The MPS-O requires the respondent to adopt the perspective of seeing oneself through the eyes of others, which is an essential component of SFA (Clark & Wells, 1995). We used only MPS-O subscales to measure the subjective degree of SFA.
- 3) Metacognition about Focused Attention in Social Anxiety Questionnaire (MFAQ; Tomita & Kumano, 2016): The MFAQ comprises a four-factor structure: Positive and negative metacognitive beliefs

about SFA, and positive and negative metacognitive beliefs about OFA.

4) The Japanese version of Short Fear of Negative Evaluation Scale (SFNE; Sasagawa et al., 2004): We used the SFNE to measure fear of negative evaluation.

5) Eye movement during speech tasks

The participants performed speech tasks in front of a monitor that displayed four audiences; two acted out positive and negative gestures while the other two acted out neutral gestures. Two sets of 60 seconds \times 2 times speech tasks were performed. We measured the visual scanpath, that is, the total length of the straight lines connecting the movement histories with lines and the number of eye movements. An eye-tracking device (QG-Plus, DITECT, Japan) measured eye movements during the tasks.

Procedure: The study was explained to the participants before they signed a statement of consent. Subsequently, they completed the SFNE and MFAQ. Thereafter, they sat in front of a computer where the experimenter explained the speech tasks to them. During each speech task, the participant's eye movements were tracked by an eye-tracker. After each speech task, the participant evaluated the subjective degree of SFA and OFA during speech using the FAS and MPS.

Analysis: Correlation analysis was performed between the scanpath during the speech tasks, the number of eye movements, SFA, OFA, and the metacognitive beliefs that controls both.

Results

The results of correlation analysis are presented in Table 1. The scanpath revealed a weak negative

correlation between FAS-self-focused, MPS-observer perspective, positive metacognitive beliefs about SFA, and negative metacognitive beliefs about OFA. On the other hand, the number of eye movements revealed a significant positive correlation with negative metacognitive beliefs about OFA.

Discussion

The results revealed that those who exercised SFA during the speech tasks and those who had high positive metacognitive beliefs about SFA had shorter scanpaths; thus, they moved their eyes less. Clark and Wells (1995) suggested that people do not look at external stimuli when increasing SFA. In this study, the eye movements that did not appear when viewing various stimuli without bias were observed, which partially supported Clark and Wells (1995). Furthermore, these relationships were not shown for OFA. The possibility that SFA can be captured independently by measuring the scanpath was suggested. The number of movements may predict OFA rather than SFA because the number of movements was not related to SFA and was only significantly correlated with negative metacognitive beliefs about OFA. However, there was no significant correlation between the degree of OFA and the number of movements. In order to clarify whether the count of eye movements is useful to measure OFA, the relationship between the number of movements and the target gaze needs to be investigated.

Ethical approval. Written informed consent was obtained from all participants. All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee (the Ethics Review Committee on Research with

Human Subjects, 2015-196) and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

Funding. This work was partly supported by JSPS KAKENHI under Grant JP19K21009, JP18H05817, JP17J10711 to N.T., and JP16K04389 to H.K.; and a Research Grant for Public Health Science awarded to N.T.

References

- American Psychiatric Association (2013). *Diagnostic and statistical manual of mental disorders, 5th ed.* American Psychiatric Association, Washington DC.
- Clark, D. M. & Wells, A. (1995). A cognitive model of social phobia. In Heimberg, R. G., Liebowitz, M. R., & Hope, D. A. et al. (Eds), *Social phobia: Diagnosis, assessment, and treatment* (pp. 69–93), New York: Guilford Press.
- Rapee, R. M., & Heimberg, R. G. (1997). A cognitive-behavioral model of anxiety in social phobia. *Behaviour Research and Therapy, 35*, 741–756.
- Sasagawa, S., Kanai, Y., Muranaka, Y., Suzuki, S., Shimada, H., & Sakano, Y. (2004). Development of a short fear of negative evaluation scale for Japanese using item response theory, *Japanese Journal of Behavior Therapy, 30*, 87–98.
- Tomita, N. & Kumano, H. (2016). Development of the Metacognitions for Focused Attention Scale: Confirming its Reliability and Validity. The 17th Asian Congress of Psychosomatic Medicine, 82. Available from: http://bit.ly/MFA_Scale

Tomita, N., Shima, T., & Kumano, H. (2018). Developing the mental perspective scale for social anxiety disorder. *Japanese Journal of Psychosomatic Medicine*, *58*, 65–73.

Wells, A. (2007). Cognition about cognition: Metacognitive therapy and change in generalized anxiety disorder and social phobia. *Cognitive and Behavioral Practice*, *14*, 18–25.

Yamada, S., Sekiguchi, Y., Ito, Y., & Nedate, K. (2002). Development of the focused attention scale (FAS) and investigation into its reliability and validity. *Human Science Research*, *11*, 161–173.

Table 1. The relationship between visual scanpath, count of eye movement, self-focused attention, and other-focused attention.

	Scanpath	Count
Self-focused attention (SFA)		
FAS-Self	− .33 [†]	− .15
MPS-Observer perspective	− .30 [†]	.05
Positive metacognitive beliefs about SFA	− .36*	− .04
Negative metacognitive beliefs about SFA	− .15	.13
Other-focused attention (OFA)		
FAS-Others	− .07	.17
Positive metacognitive beliefs about OFA	− .34 [†]	.06
Negative metacognitive beliefs about OFA	− .01	.50**
Fear of negative evaluation	− .12	.41*

** $p < .01$, * $p < .05$, [†] $p < .10$

Note; FAS = Focused Attention Scale, MPS = Mental Perspective Scale for Social Anxiety Disorder