九州大学学術情報リポジトリ
Kyushu University Institutional Repository

# Effect of empathy trait and gender on attention to face

崔, 多美

https://doi.org/10.15017/1500799

出版情報：九州大学, 2014, 博士（芸術工学）, 論文博士
バージョン：
権利関係：全文ファイル公表済

# Effect of empathy trait and gender on attention to face

共感特性と性別が顔に対する注意反応に及ぼす影響

Summary of PhD thesis

**Damee Choi**

崔　多美

Graduate School of Integrated Frontier Sciences
Kyushu University

February 2015

# Table of contents

**Chapter 1** Background .....3

**Chapter 2** Effect of empathy trait on attention to face and non-face stimuli .....4

**Chapter 3** Gender difference in attention to face and non-face stimuli .....5

**Chapter 4** Effect of empathy trait on attention to various facial expressions .....6

**Chapter 5** Gender difference in attention to various facial expressions .....7

**Chapter 6** Conclusion .....8

# Chapter 1
# **Background**

## Summary

Humans are considered social animals. To achieve amicable social interactions, it is important for humans to pay attention to the faces of other humans and to discriminate facial expressions accurately. However, attention response to faces is thought to differ depending on characteristics of individuals such as personality and gender.

*Effect of empathy trait on attention to face*

In order to extend the knowledge of individual difference in attention response to faces, this thesis aimed to investigate effect of empathy trait on attention to faces. To do so, I conducted two experiments and examined attention responses elicited by discrimination of facial expressions. In those two experiments, event-related potential (ERP) was measured as index of attention. Empathy trait of individuals was measured by using Interpersonal Reactivity Index (IRI) questionnaire.

*Gender difference in attention to face*

Gender is also important factor of individual difference in attention to faces. Many neuroscience studies have reported that brain activity elicited in response to human faces differs between males and females. However, it is still unclear whether there is gender difference in attention to faces even when empathy trait does not differ between genders. Thus, this thesis also aimed to investigate gender difference in attention to faces, by reanalyzing data from two experiments mentioned above.

# Chapter 2
# Effect of empathy trait on attention to face and non-face stimuli

## Summary

*Purpose*
In this chapter, I aimed to examine the relationship between empathy trait (as measured by the IRI) and the Late positive potential (LPP) elicited by discriminating facial expressions (happy or angry).

*Methods*
Thirty-two Japanese university or graduate school students participated in the study (17 men, 15 women). They filled out the Japanese version of the IRI. Electroencephalography (EEG) was recorded while participants discriminate facial expressions (happy or angry) or flower colors (yellow or purple). Early LPP (mean amplitude in the 300 to 600 ms) and late LPP (mean amplitude in the 600 to 800 ms) were analyzed.

*Results and discussion*
The statistical results revealed that empathy trait correlated positively with both early and late portions of LPP elicited when discriminating facial expressions, but not flower colors. This indicates that individuals with high empathy trait, compared with those with low empathy trait, pay more attention to when discriminating facial expression, not when discriminating flower colors. This suggests a possibility that individuals with high empathy trait might have a tendency to be especially sensitive to face, not to non-face stimuli (for example, flowers).

*Declaration*
This chapter is based on the paper "Effect of empathy trait on attention to faces: an event-related potential (ERP) study (Choi D, Watanuki S, J Physiol Anthropol 2014, 33:1)".

# Chapter 3
# Gender difference in attention to face and non-face stimuli

## Summary

*Purpose*
In this chapter, I aimed to gender differences in LPP elicited by discriminating facial expressions (happy or angry) and flower colors (yellow or purple), by reanalyzing data from Chapter 2.

*Methods*
Participants and the experimental procedure were the same as in Chapter 2, except for statistical analysis. In addition, I calculated LPP peak (most positive potential within 300-800 ms).

*Results and discussion*
Both males and females showed generally greater amplitude of LPP (LPP peak, early LPP, and late LPP) when discriminating facial expressions than when discriminating flower colors. However, there were also some gender differences in LPP responses. First, females showed greater LPP peak in response to discrimination of facial expressions, not in response to discrimination of flower colors. Second, late LPP was greater in response to discrimination of facial expressions than in discrimination of flower colors at the central area in females, not in males. These results that both males and females pay more attention faces than to non-face stimuli, but this tendency is more dominant in females than in males. In addition, there was no gender difference in empathy trait in the present study. Thus, gender difference in attention to face seems to result from gender *per se* more than empathy trait of individuals.

# Chapter 4
# Effect of empathy trait on attention to various facial expressions

## Summary

*Purpose*
In this chapter, I aimed to investigate the relationships between the IRI and ERP responses (N170 and LPP) elicited by discriminating emotional facial expressions (happy, angry, surprised, afraid, and sad) from emotionally neutral faces.

*Methods*
Twenty-two Japanese university or graduate school students participated in the study (12 men, 10 women). They filled out the Japanese version of the IRI. EEG was recorded while participants discriminate emotional facial expressions (happy, angry, surprised, afraid, and sad) from emotionally neutral faces. N170 (mean amplitude in the 140 to 200 ms), early LPP, and late LPP were analyzed.

*Results and discussion*
IRI correlated negatively with N170 in response to happy, angry, surprised, and afraid faces, but correlated positively with LPP in response to happy, angry, surprised, afraid, and sad faces. This indicates that individuals with high empathy pay greater attention to various facial expressions than those with low empathy, from the very early stage (reflected in N170) to the late stage (reflected in LPP) of facial processing. In addition, the relationship between empathy trait and attention to face was strongest for the surprised facial expression. This might result from the ambiguity of the surprised facial expression.

*Declaration*
This chapter is based on the paper "Effect of empathy trait on attention to various facial expressions: Evidence from N170 and late positive potential (LPP) (Choi D et al., J Physiol Anthropol 2014, 33:18)".

# Chapter 5
# Gender difference in attention to various facial expressions

## Summary

*Purpose*
In this chapter, I aimed to examine gender differences in ERP responses (N170 and LPP) elicited by discriminating emotional facial expressions (happy, angry, surprised, afraid, and sad) from emotionally neutral faces, by reanalyzing data from Chapter 4.

*Methods*
Participants and the experimental procedure were the same as in Chapter 4, except for statistical analysis. In addition, I calculated LPP peak.

*Results and discussion*
I found gender differences in discriminating facial expressions in LPP, but not in N170. This suggests that gender differences in face processing are more obvious in the late stage (reflected in LPP) than in the early stage (reflected in N170) of attention. In addition, there was no gender difference in empathy trait in the present study. Thus, females may pay attention to human faces more than males in the late stage of face processing, even when no gender difference in empathy trait is present. This might be related to biological specialization between genders, such as physical attributes and reproductive capacity.

# Chapter 6
# **Conclusion**

## Summary

*Summary and general discussion*

In this thesis, I focused on empathy trait and gender as factors of individual difference in attention response to faces. The results of two experiments showed increased attention to face in individuals with high empathy compared with those with low empathy, and in females compared with in males. This is interpreted as that empathy trait and gender of observer affect importance of understanding emotional state of others. Taken together, this thesis suggests that ability and methods to adapt to social environments differ depending on both empathy trait of individuals and biological characteristics of gender.

*Future work*

It seems to be important to clarify how empathy is related with prosocial behavior in everyday life. Future studies thus should adopt tasks to involve participants with more complicated social situations than task used in this thesis (i.e., discrimination of facial expressions), in order to clarify the relationship between empathy and prosocial behaviors.