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Gender differences in emotion experience perception under different facial muscle manipulations

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ABSTRACT

According to embodied emotion theory, facial manipulations should modulate and initiate particular emotions. However, whether there are gender differences in emotion experience perception under different facial muscle manipulations is not clear. Therefore, we conducted two behavioral experiments to examine gender differences in emotional perception in response to facial expressions (sad, neutral, and happy) under three conditions: (1) holding a pen using only the teeth (HPT), which facilitates the muscles typically associated with smiling; (2) holding a pen using only the lips (HPL), which inhibits the muscles typically associated with smiling; and (3) a control condition – hold no pen (HNP). We found that HPT made the emotional feelings more positive, and that the change degree of female's ratings of sad facial expressions between conditions (HPL to HPT) was larger than males'. These results suggested cognition can be affected by the interaction of the stimuli and the body, especially the female.

1. Introduction

Embodied cognition theory (ECT), which proposes that psychological processes are influenced by body morphology and sensory and motor systems (Glenberg, 2010), has been supported by many studies. Following the development of ECT in cognitive science, many experiments were performed to try to test it in the fields of social cognition and emotion (Adolphs, 2002).

Adolphs (2002) reported that the embodied emotion was that perception of emotional meaning involved embodiment of the implied emotion (Adolphs, 2002). In other words, simulation of the states in the systems that were relevant to the meaning of observed emotion had been triggered, including motor, sensory, and affective systems (Glenberg, 2010; Niedenthal, 2007). A lot of behavioral substantial evidences supported for the embodied emotion account. For example, some researchers considered that the embodied emotion means that the individuals understood the emotion of perceived facial expressions by mimicking (Atkinson & Adolphs, 2005; Oberman, Winkielman, & Ramachandran, 2007). Oberman et al. (2007) reported that

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the ability of recognition of particular emotional expressions would be hider when the mimicking activities in facial muscles were blocked (Oberman et al., 2007). Furthermore, Niedenthal, Brauer, Halberstadt, and Innes-Ker (2001) performed a behavioral experiment to support the embodied emotion and the facial mimicry, they asked the subjects to held a pen by using their lips or teeth identified the point at which the expressions changed from happy to sad and vice versa later, compared to participants who were in no pen condition (free movement), they found that the important role of the mimicry in the facial expressions perception (Niedenthal et al., 2001). In addition, abundant of brain image experiments had proved that facial mimicry was important for recognition of emotional expressions, showing as the mirror neuron system activities (Gallese, Fadiga, Fogassi, & Rizzolatti, 1996; Grezes & Decety, 2001; Iacoboni, 2005). For example, Budell, Jackson, and Rainville (2010) found that perception of painful face recruits limbic regions involved in the coding of self-pain, prefrontal areas involved emotional cognition, and premotor and parietal areas involved in motor mirroring (Budell et al., 2010). In other words, the embodied emotion theory suggested the perception of a body activation reactivated relevant the corresponding emotion and the neural circles. People used the embodied simulation to acquire the equivalence between what the others did and felt and what oneself did and felt, on which an interpretation or judgment was based (Gallese, 2007). In sum, considerable studies proved and showed that the embodied emotion which means that modulating functions of facial action on emotion.

Although a growing body of research has revealed the importance of facial mimicry in emotional feeling, this research has ignored gender differences. It is known that depression is more prevalent in females than males and that depressed females experience more negative emotions than depressed males; they also report greater symptom severity than males (Yuan et al., 2009). Generalized anxiety disorder (GAD), which is another affective disorder, also is more prevalent in females than males (Yuan et al., 2009). Moreover, females reported being more susceptible to negative emotions (Yuan et al., 2009).

So test whether there is a gender difference in the emotional experience perception under different facial manipulations is aim of this study. In the present study, we performed two experiments to explore gender differences in the emotional experience of facial expressions under different facial-muscle manipulations. According to previous research, holding a pen with the lips (HPL), which inhibits the smiling muscles, was similar to holding no pen (HNP), in terms of their effects on instinctive brain activity. This makes HPL an ideal baseline for a hold a pen with teeth (HPT) condition, by eliminating the influence of facial-muscle action (Chang, Zhang, Hitchman, Qiu, & Liu, 2014). So, in Experiment 1, we tested the difference between the HPL and HNP on behavioral reactions, and investigated gender differences in emotional experience using a facial-muscle manipulation (HPL) and no facial-muscle manipulation (HNP). In Experiment 2, we conducted a behavioral study to explore gender differences in the embodied emotion.

2. Experiment 1

2.1. Materials and methods

2.1.1. Participants

One hundred and fifty-five undergraduate students (78 females, 77 males, mean age = 20.2; range = 17–23), from Xinxiang Medical University and the Henan Institute of Science and Technology in China, participated in this experiment as paid volunteers. All of them were right-handed and none of them had a history of neurological or psychiatric problems. All participants provided written informed consent prior to the study, which was approved by the Institutional Human Participants Review Board of Xinxiang Medical University.

Furthermore, each participant was evaluated based on their level of trait anxiety and state anxiety using the Trait-State Anxiety Inventory (T-SAI) (Spearing, 2001; Spielberger, 2010). The T-SAI had been valued for its high reliability based on its internal consistency and a test-reliability ranging from 0.73 to 0.86 across multiple samples (Spielberger & Gorsuch, 1983). There were no significant difference between the female and male in trait anxiety scores and state anxiety scores (see Table 1).

2.1.2. Stimuli

The stimuli consisted of 240 emotional facial expressions (happy, neutral, and sad facial expressions) from the College Students' Facial Expression System (Wang & Luo, 2005). Subjects were required to hold a pen in their lips or not hold a pen while they rated the emotion of each facial expression. In this study, the HPL inhibited the happy facial muscles movement, and neither facilitated nor inhibited the sad facial muscles movement.

Table 1
Trait and State Anxiety scores of all subjects in experiment 1 and experiment 2.

	Female (mean ± s)	Male (mean ± s)
Trait Anxiety Scores (Exp. 1.)	43.9 ± 5.6	42.2 ± 6.4
State Anxiety Scores (Exp. 1.)	45.6 ± 5.6	44.0 ± 6.8
Trait Anxiety Scores (Exp. 2.)	42.5 ± 6.5	41.4 ± 6.7
State Anxiety Scores (Exp. 2.)	43.8 ± 5.9	43.2 ± 7.2