



Effects of social anxiety on metaphorical associations between emotional valence and clothing brightness

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ABSTRACT

Background and Objectives: Individuals with social anxiety have various types of deficiencies in emotional processing. Diversity of deficiencies may imply that socially anxious individuals have malfunctions in fundamental parts of emotional processing. Therefore, we hypothesized that social anxiety contributes to deficiencies in building on the metaphorical relationship between emotional experience and brightness.

Methods: We conducted a judgment task of valences of faces with manipulated clothing brightness (bright or dark).

Results: A congruency effect between the emotional valence and clothing brightness was observed in participants with low social anxiety. However, this pattern was not found in participants with high social anxiety. The results suggested that a deficiency in metaphorical associations leads to maladaptive emotional processing in individuals with social anxiety.

Limitations: Our findings cannot be directly generalized to clinical populations. Such populations should be tested in the future studies.

Conclusions: We may expand Lakoff and Johnson's (1999) conceptual metaphor theory by showing the relationships between social anxiety and malfunction in metaphorical processing. Malfunctions in metaphorical processing could lead to various types of psychological disorders which have deficiencies in emotional processing.

1. Introduction

A metaphorical association between emotional valence and brightness is found widely in daily life. For example, heroes tend to wear bright clothes whereas villains tend to wear dark clothes in the movies or comics (e.g., Jedi knight vs. Sith lord in Star Wars). Such associations between emotional valence and brightness have been found in previous studies (Landau, Robinson, & Meier, 2014; Meier, Fetterman, & Robinson, 2015; Meier, Robinson, & Clore, 2004; Meier, Robinson, Crawford, & Ahlvers, 2007a; Meier, Schnall, Schwarz, & Bargh, 2012; Okubo & Ishikawa, 2011; Song, Vonasch, Meier, & Bargh, 2012). Lakoff and Johnson (1999) conceptual metaphor theory suggests that metaphorical associations have a fundamental function for understanding thoughts and emotions. They propose that thoughts and emotions are represented only after being metaphorically associated with concrete physical experiences. Without such associations, people would have difficulty understanding emotional experiences because emotional

experiences lack references to physical reality. To test this hypothesis, Meier et al. (2004) investigated metaphorical associations between emotional valence and brightness using a valence judgement task. Participants judged positive words faster when they were presented in bright font than in dark font, whereas participants judged negative words faster when they were presented in dark font than in bright font, suggesting that physical metaphors (e.g., light is good) play an essential role in conceptualizing emotional experience (Meier et al., 2004). Likewise, such metaphorical associations allow people to use their social knowledge as a framework for understanding self and others (Landau et al., 2014). For example, people tend to use emotion-brightness metaphors to describe their friends or family (e.g. he/she is a bright person). Without such metaphors, people may have difficulty in social interactions. The essential role of metaphorical association between emotion and brightness is now widely recognized, supporting the framework of embodied cognition (Barsalou, 1999, 2008; Landau et al., 2014; Meier et al., 2004, 2007a,b, 2012; Okubo & Ishikawa, 2011; Song

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et al., 2012).

Some studies have reported the individual difference of metaphorical processing such as metaphor usage (Fetterman, Bair, Werth, Landkammer, & Robinson, 2016), personality trait (Meier & Robinson, 2006; Meier, Sellbom, & Wygant, 2007b) and psychological disorder (Meier & Robinson, 2006). However, in our knowledge, there was no study which investigates the effect of social anxiety on the metaphorical associations. Studies have reported that individuals with social anxiety have various types of deficiencies in emotional processing, such as an intense fear of negative evaluation from others (Clark & Wells, 1995; Rapee & Heimberg, 1997), a deficiency in identifying their emotions (Turk, Heimberg, Luterek, Mennin, & Fresco, 2005), a tendency to react negatively to emotional experiences (Goldin, Manber, Hakimi, Canli, & Gross, 2009; Turk et al., 2005) and a reduction of positive emotions (Kashdan, 2007). Such diversity of deficiencies may imply that socially anxious individuals have malfunctions in fundamental parts of emotional processing. According to Lakoff and Johnson (1999), metaphorical associations are fundamental in understanding emotional experience. Therefore, we hypothesized that malfunction in metaphorical processing leads to deficiencies in emotional processing in individuals with social anxiety.

We hypothesized that individuals with social anxiety had a deficiency in metaphorical processing. Such a deficiency in individuals with social anxiety might be associated with their misinterpretation of their physical experiences in social situations (Edelmann & Baker, 2002; Kanai et al., 2009; Rapee & Heimberg, 1997). For example, Edelmann and Baker (2002) examined the effect of social anxiety on the relationship between physiological reactions (e.g. skin conductance, heart rate, and face temperature) and self-reports of physical sensations. Their results indicated that there were no differences in physiological reactions between the participants with social anxiety and the healthy controls. On the other hands, the rating of physical sensations was higher in participants with social anxiety than in the healthy controls, indicating that socially anxious individuals did not properly interpret their physical sensations (Edelmann & Baker, 2002). We speculate that if individuals with social anxiety could not properly perceive their physical experiences, then they could not metaphorically associate emotional experiences and physical experiences. This misinterpretation of physical experiences may be responsible for the malfunction in metaphorical processing in individuals with social anxiety. Consistent with this, metaphors are widely used to understand emotions in clinical therapies for emotional disorders, such acceptance and commitment therapy (ACT) and mindful-based cognitive therapy (MBCT) (Eifert & Forsyth, 2005; Forsyth & Eifert, 2008; Hayes, Strosahl, & Wilson, 1999; Levin, Hildebrandt, Lillis, & Hayes, 2012). In the MBCT for social anxiety, participants are encouraged to intimately relate their physical sensations and emotional experience by using metaphors (Kocovski; Fleming & Rector, 2009; Kocovski, Fleming, Hawley, Huta, & Antony, 2013). Such an exercise is one of a key of feature of the MBCT for social anxiety when participants try to understand their emotional experience.

The aim of the present study is to investigate the effect of social anxiety on metaphorical processing. We hypothesized that individuals with social anxiety have a deficiency in building on the metaphorical relationships between emotional experience and brightness because they could not properly interpret their physical experiences. To test this hypothesis, we used a valence judgement task, which has been used for investigating the metaphorical associations between emotional valence and brightness in previous studies (Meier et al., 2004, 2015; Okubo & Ishikawa, 2011). We used face stimuli and clothing brightness to investigate the metaphorical association in individuals with social anxiety. Previous studies have reported that socially anxious individuals have a deficiency in emotional processing of the facial expressions of others (Clark & Wells, 1995; Rapee & Heimberg, 1997). Our specific predictions were as follows. The metaphorical associations between emotional valence and brightness are smaller for participants with high social anxiety than for those with low social anxiety. Moreover, levels

of social anxiety are negatively correlated with levels of metaphorical associations between emotional valence and brightness.

2. Method

2.1. Participants

Seventy-three university students (30 men and 43 women, $M_{age} = 20.7$ years, $SD = 1.3$) were recruited in this study. We obtained written informed consent from the participants.

The sample size used in the present experiment was based on an a priori power analysis conducted in G*Power 3.1 (Faul, Erdfelder, Lang, & Buchner, 2007). Assuming an effect size of partial eta squared = 0.24 (derived from Okubo & Ishikawa, 2011), a significance level of alpha = .05 and two participant groups, we determined that a total sample size of 50 participants ($n = 25$ per group) would provide 80% power to detect effects. To exceed this criterion, considering potential drop-outs and to achieve greater than 80% power, we recruited 73 participants ($n = 35$ –38 per group).

To assess the levels of social anxiety, we used the Japanese version of the Short Fear of Negative Evaluation Scale (SFNE; Sasagawa et al., 2004). The SFNE has good internal consistency (Cronbach's $\alpha = 0.92$) and good test–retest reliability ($r = 0.74$). We found good internal consistency in the present study (Cronbach's $\alpha = 0.93$). To assign approximately the same number of participants for each group, we used a median split to divide participants into two groups (high vs. low social anxiety). Participants whose anxiety scores were over the median (median = 45) were classified into the high social anxiety group ($n = 38$, 17 men and 21 women), whereas those at the median and under were classified into the low social anxiety group ($n = 35$, 13 men and 22 women).

2.2. Materials

We used a total of 40 face photographs defined by an orthogonal combination of 10 models (6 men and 4 women), 2 facial expressions (happy and angry) and 2 clothing brightness (bright and dark clothing).

Adobe Photoshop was used to manipulate the models' clothing. As Fig. 1 shows, to manipulate a model's clothing, the face of the model was cut out from the original photograph, which was obtained from the ATR Facial Expression Image Database (DB99; ATR-Promotions, Kyoto, Japan; <http://www.atr-p.com/face-db.html>), and was pasted on a faceless photograph with either bright or dark clothing (see Fig. 1).

2.3. Procedure

Participants were seated in a dimly lit room approximately 570 mm away from the display with their head positioned on a chinrest. Participants were asked to respond as quickly and as accurately as possible. In each trial, the fixation point was presented for 500 ms at the center of the screen. After the presentation of the fixation point, a facial photograph was presented for 168 ms at a distance of 3° from the fixation point, either to the left visual-field or the right visual-field. Participants were asked to indicate whether the facial expression was positive or negative by pressing keys. The finger mapping was counter balanced in each participant. Based on a previous study (Okubo & Ishikawa, 2011), we presented the stimuli peripherally to control task difficulty; a ceiling effect was expected when the stimuli were presented in the center of the screen. There were 80 distinct trials, which consisted of 10 models \times 2 facial expressions (angry and happy) \times 2 clothing brightness (bright and dark clothing) \times 2 visual fields (left and right). The trials were repeated three times; therefore, the total number of trials was 240.

Based on previous studies (Meier et al., 2004; Okubo & Ishikawa, 2011), we used a response temporal deadline procedure to make participants respond very quickly. When participants responded slower

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