



You may look unhappy unless you smile: The distinctiveness of a smiling face against faces without an explicit smile



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ARTICLE INFO

Article history:

Received 8 November 2014

Received in revised form 17 February 2015

Accepted 10 March 2015

Available online 24 March 2015

PsycINFO classification:

2323

2343

2346

3040

Keywords:

Facial expression

Expressionless face

Emotion categorization

ABSTRACT

An expressionless face is often perceived as rude whereas a smiling face is considered as hospitable. Repetitive exposure to such perceptions may have developed stereotype of categorizing an expressionless face as expressing negative emotion. To test this idea, we displayed a search array where the target was an expressionless face and the distractors were either smiling or frowning faces. We manipulated set size. Search reaction times were delayed with frowning distractors. Delays became more evident as the set size increased. We also devised a short-term comparison task where participants compared two sequential sets of expressionless, smiling, and frowning faces. Detection of an expression change across the sets was highly inaccurate when the change was made between frowning and expressionless face. These results indicate that subjects were confused with expressed emotions on frowning and expressionless faces, suggesting that it is difficult to distinguish expressionless face from frowning faces.

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1. Introduction

We often smile during daily conversations with family members, friends, coworkers, and even when encountering strangers. This is because of a common sense that having a smile on one's face is beneficial for close intimacy with social acquaintances. The preference of smiling faces in society may have derived from the belief that a smiling face in many circumstances conveys a sense of warm hospitality. No other facial expressions can replace the positive role of a smile. However, the belief suggests another potential bias that an absence of a smile may indicate a negative mood in some circumstances.

Faces expressing negative mood do not necessarily mean they must possess an explicit facial expression such as a frown from anger. For instance, a lack of facial expressions can often be read as no interest or simply being in a bad mood. Compared to an explicit frown, an expressionless face can be another form of expressing one's negative mood, and there is a great chance of a bias towards stereotyping the expressionless faces as conveying negative emotion. This was demonstrated in several studies where expressionless faces were recognized to be more negative than positive (Lee, Kang, Park, Kim, & An, 2008), and were less discriminable from angry faces than from happy faces (Mermillod, Vermeulen, Lundqvist, & Niedenthal, 2009).

Nevertheless, the bias of stereotyping an expressionless face as a face with negative emotion has not been of major interest. Instead, many studies have focused on the distinctiveness of faces expressing positive or negative emotions, with the assumption that there is no distinct category of expressed emotions on expressionless faces. For instance, expressionless faces were assumed to be emotionally ambiguous and thus used at most as control stimuli against friendly or threatening faces regardless if they are real or line drawings (Eastwood, Smilek, & Merikle, 2001; Fox et al., 2000; Horstmann & Bauland, 2006; Lundqvist & Öhman, 2005).

However, a few concerns need to be addressed when defining expressionless faces as emotionally neutral and ambiguous. First, many studies posit that the visual ambiguity in an expressionless face is analogous to emotional ambiguity in its expressed emotion, assuming no resemblance to either friendly or threatening faces (Leppänen & Hietanen, 2004). This assumption is rather problematic, because a lack of visual distinctiveness on expressionless face does not necessarily mean that the face must be read as equally expressing positive or negative emotions. In reality, such ambiguity in an expressionless face is difficult to resolve unless explicit perceptual or social contexts are provided for the resolution (Russell & Fehr, 1987). Laboratory experiments have shown that recognition of expressed emotion on any faces can be difficult when the faces are surrounded by a crowd of distracting faces with a variety of emotional expressions (Horstmann & Bauland, 2006; Lipp, Price, & Tellegen, 2009; Pinkham, Griffin, Baron, Sasson, & Gur, 2010).

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Second, the studies have heavily emphasized a 'fear advantage', the salience of negative facial expressions against other categories of facial expressions (Hansen & Hansen, 1988; Öhman & Mineka, 2001; Stein, Seymour, Hebart, & Sterzer, 2014; Tamietto & De Gelder, 2010; Whalen, Rauch, Etcoff, McInerney, Lee, & Jenike, 1998; Yang, Zald, & Blake, 2007). This may be due to the evolutionary idea that avoiding any imminent threats predicted from others' facial expressions must be an important strategy for survival. A practical concern for clinical implications may have played a role in the emphasis, because a raised level of anxiety under any imminent threat often evokes maladaptive behaviors necessitating clinical interventions (Foa, Gilboa-Schechtman, Amir, & Freshman, 2000; Joormann & Gotlib, 2008; Mogg, Millar, & Bradley, 2000).

Nevertheless, there is also a body of studies that have provided evidence of 'happy advantage' in recognition or perceptual tasks (Calvo, Fernández-Martín, & Nummenmaa, 2014; Calvo & Nummenmaa, 2011; Juth, Lundqvist, Karlsson, & Öhman, 2005; Mermillod et al., 2009; Yoon, Hong, Joormann, & Kang, 2009). Subjects showed more accurate and/or faster responses for the happy face than other facial expressions when expressions were shortly exposed and masked (Milders, Sahraie, & Logan, 2008), as well as when a carefully controlled set of facial stimuli were used (Juth et al., 2005). In addition to these studies, we also claim that studying the nature of a positive facial expression is equally important to studying a negative one. Positive facial expressions, such as smiling, are widely beneficial for social occasions. They are favored across cultures as a good strategy for survival. When properly expressed, a smile also relieves unexpected difficulties. Smiling is often clinically recommended for coping with stress (Kraut & Johnston, 1979; Mann, 2004).

Finally, an expressionless face is often read as signifying a negative mood in certain circumstances. For instance, we often judge a person without an apparent facial expression to be having a bad day and even to be threatening or frowning. If this socially-dependent interpretation prevails in our society and culture, there will be a great chance of stereotyping the expressionless face as revealing a negative mood. Studies of context-dependent recognition of facial expressions have suggested that facial expressions can be categorized according to their contextual circumstances as well as person's mood (Barrett, Mesquita, & Gendron, 2011; Ekman & O'Sullivan, 1988; Masuda et al., 2008; Niedenthal, Halberstadt, Margolin, & Innes-Ker, 2000; Russell & Fehr, 1987; Surguladze et al., 2004).

According to these ideas, we hypothesized that an expressionless face may not necessarily be identified as expressing an ambiguous emotion. Rather, the expressionless face can be stereotyped as showing a distinct emotion rather than ambiguity. Second, according to the widely accepted belief that an expressionless face can often be perceived to be expressing a negative mood, we further hypothesized

that an expressionless face can be negatively stereotyped as a frowning face.

2. Experiment 1

Experiment 1 examined whether the ambiguity of emotional expression on expressionless face can be resolved into expressing either a positive or a negative emotion. To bias the judgment of the emotion expressed on expressionless face, we devised a visual search task where participants reported the presence or absence of an expressionless target face among a set of either frowning or smiling-distractor faces. If the expressionless target face tended to be perceived as either a frown or a smile, search reaction times (RTs) would vary according to the type of distractor faces.

2.1. Methods

2.1.1. Participants

A total of twenty-one undergraduates from Chung-Ang University participated for course credits after signing an informed-consent document. Participants' age was between 19 and 24 years. They all had normal or corrected-to-normal visual acuity. Two participants who showed search accuracy below 80% were excluded from data analysis, due to inaccurate performances.

2.1.2. Stimuli and procedures

KUEFC (Korea University Facial Expression Collection; Lee, Lee, Lee, Choi, & Kim, 2006) was used for facial stimuli. Stimuli consisted of 10 different facial identities with equal gender ratio. Emotional expressions on the stimuli were sorted according to three distinct facial expressions: smiling, expressionless, and frowning. The stimuli were displayed on a 19-in. LCD monitor, with a gray background, and a viewing distance of 60 cm. The center of each $4.21^\circ \times 4.21^\circ$ photograph was 3.97° distant from a central fixation point.

Example stimuli and the procedure for Experiment 1 are illustrated in Fig. 1. In Experiment 1, the set size was fixed at four. The search target was a face with no visually distinctive facial expression (e.g., expressionless), whereas the distractors were either smiling or frowning. Participants performed a total of 192 trials with four conditions (48 trials per condition) constructed from a combination of two variables: distractor-type (smiling vs. frowning) and presence-of-target (present vs. absent).

Each trial began with a fixation point for 500 ms followed by a search array, which lasted until participants' response or for a maximum of 5000 ms if there was no response. The next trial started after an inter-trial interval of 500 ms after each trial ended. The order of the trial was randomized. Each face was randomly chosen from the KUEFC set.

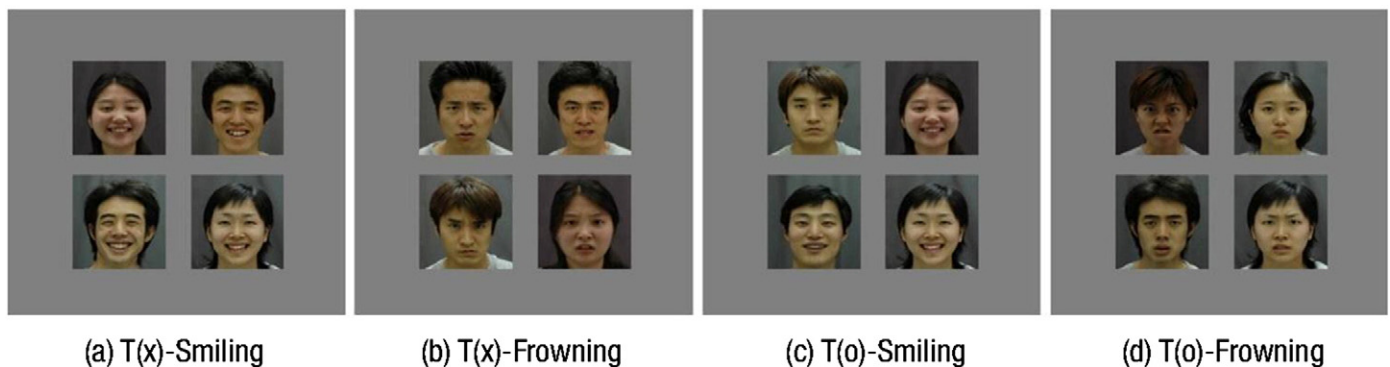


Fig. 1. Examples of search arrays for Experiment 1: (a) target absent trial in the smiling-distractor condition, (b) target-absent trial in the frowning condition, (c) target-present trial in the smiling condition, and (d) target-present trial in the frowning condition. The designated target was an expressionless face.

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