The Role of the Eyes and Mouth in Facial Emotions Revisited

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Abstract

Faces expressing happiness, sadness, fear, and anger were presented in a Stroop-like paradigm. There were three word conditions and four face conditions (full, eyes removed, mouth removed, hairline removed). Incongruent trials produced longer RTs than congruent trials with the longest RTs occurring in incongruent trials with the eyes removed.

Introduction

Internal features, such as the eyes, nose, and mouth are important for recognizing familiar faces (Bonner and Burton, 2004). In fact, the first saccade when looking at a face is to the eyes (Smith, Gosselin, and Schyns, 2004; Pearson, Henderson, Schyn, and Gosselin, 2003). The configuration of the eyes and mouth, in particular, plays an important role in recognizing normal upright faces (Williams, Moos, and Bradshaw, 2004). Watanabe, Miki, and Kakigi (2005) found that eye and mouth movements are important for perceiving the facial expression of emotion and processed in the same area of the brain (MT/V5). While these studies point to the importance of the eyes and mouth in recognizing facial emotions, research also suggests that facial features are also processed holistically (Leder and Carbon, 2005).

Altering the way in which a face is presented can alter attention. For instance, Davies and Hoffman (2002) showed that inversion impairs attention to faces. Lundqvist and Ohman (2005) argued that emotion influences attention. Koch (2005) presented faces with occluded central or inner facial features in a Stroop paradigm to examine the relationship between attention, facial features, and the perception of facial emotions. Specifically, there were three word conditions (no word, congruent emotion word, incongruent emotion word) and three face conditions (full face, eyes removed, mouth removed). He found that full faces produced significantly shorter RTs than faces with either the eyes or mouth removed but no difference between the eyes removed and mouth removed conditions. This finding suggests that the eyes and mouth may be equally important in recognizing facial emotions.

The present study was conducted to determine if the interference found by Koch (2005) was due to the removal of particular central features (i.e., the eyes and mouth) or simply due to the removal of any facial information.

Method

Participants

Seventeen undergraduates volunteered to participate in the study. All participants had normal or corrected to normal visual acuity. However, upon analysis, four participants made excessive errors and one participate had extreme RTs. Therefore, five participants were removed for analysis resulting in a sample of 12 college students (nine female).

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Design

As in Koch (2005), pictures of faces expressing the emotions of anger, sadness, happiness, and fear were taken from Ekman and Friesen (1971, 1975; Figure 1). The pictures were presented with no word (64 trials), a congruent emotion word (64 trials, or an incongruent emotion word (192 trials; Figure 2). In addition, four face conditions (complete face, eye removed, mouth removed, hairline removed) were presented an equal number of trials within each word condition.

Figure 1. Example faces from Ekman and Friesen (1971, 1975) used in the study.

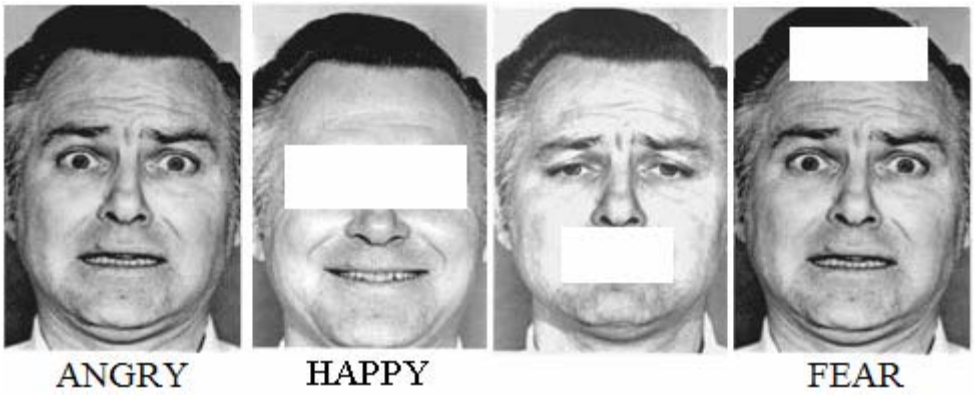

Figure 2. Examples of an incongruent full face, congruent eyes removed face, no word mouth removed face, and congruent hairline removed face.

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Procedure

Participants viewed a grid of faces expressing the four emotions used in the study and were instructed to name each emotion while practicing the key coding ("z" = anger, "x" = sadness, "." = happiness, "/" = fear). Participants were then instructed to press the key corresponding to the emotion expressed on subsequent trials. The experimental trials followed. For each trial, the face-word stimulus was presented until a response was made. Participants initiated the next trial by pressing the spacebar. Response times and errors were recorded by the computer using SuperLab.

Results

Descriptive statistics for the 12 face by word conditions are presented in Table 1. A repeated-measure ANOVA revealed a moderate main effect of word condition ($F(2, 22) = 3.02$, $p<.07$; $\eta^2=.23$) with the incongruent condition producing the slowest RTs (Figure 3). There was a significant main effect for the face conditions ($F(3,33)=3.62$, $p=.023$; $\eta^2=.25$) with all conditions producing slower RTs than the full face condition (Figure 4). Finally, there was a significant word condition x face condition interaction ($F(6,66)=3.85$, $p=.002$; $\eta^2=.26$; Figure 5).

Table 1. Descriptive statistics for the 12 face x word conditions.

Condition	M	SD
Full Face – No Word	919.50	136.89
Eyes Removed – No Word	1094.33	200.57
Mouth Removed – No Word	1077.63	204.95
Hairline Removed – No Word	1261.79	281.48
Full Face – Congruent	1045.75	295.72
Eyes Removed – Congruent	1057.75	193.82
Mouth Removed – Congruent	1135.04	294.67
Hairline Removed – Congruent	997.63	158.19
Full Face – Incongruent	1077.29	174.06
Eyes Removed – Incongruent	1245.04	189.80
Mouth Removed – Incongruent	1161.88	195.97
Hairline Removed – Incongruent	1078.58	185.74

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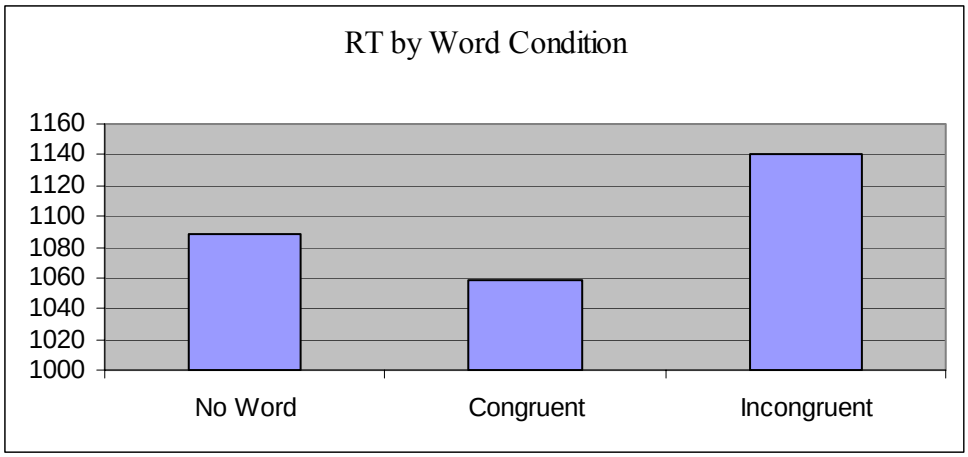

Figure 3. RT by word condition. Stroop facilitation was not significant but incongruent stimuli produced significant interference.

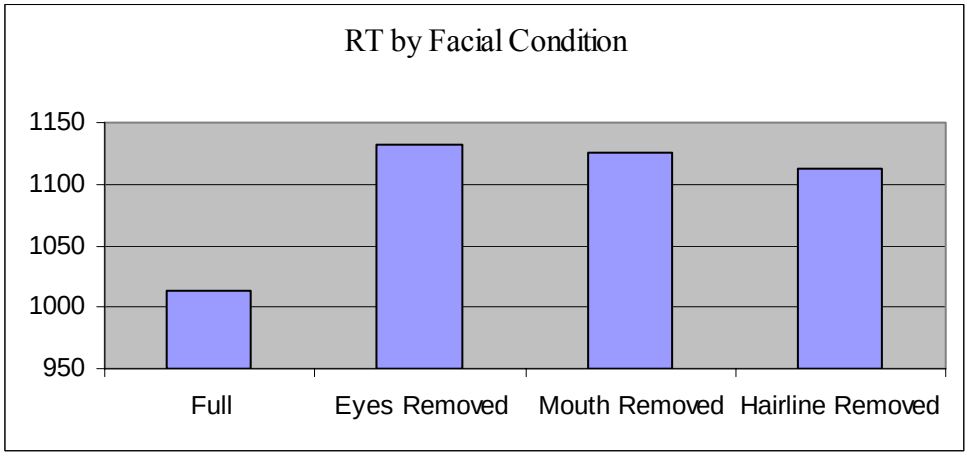

Figure 4. RT by face condition. The full face condition produced significantly faster RTs than all other conditions.

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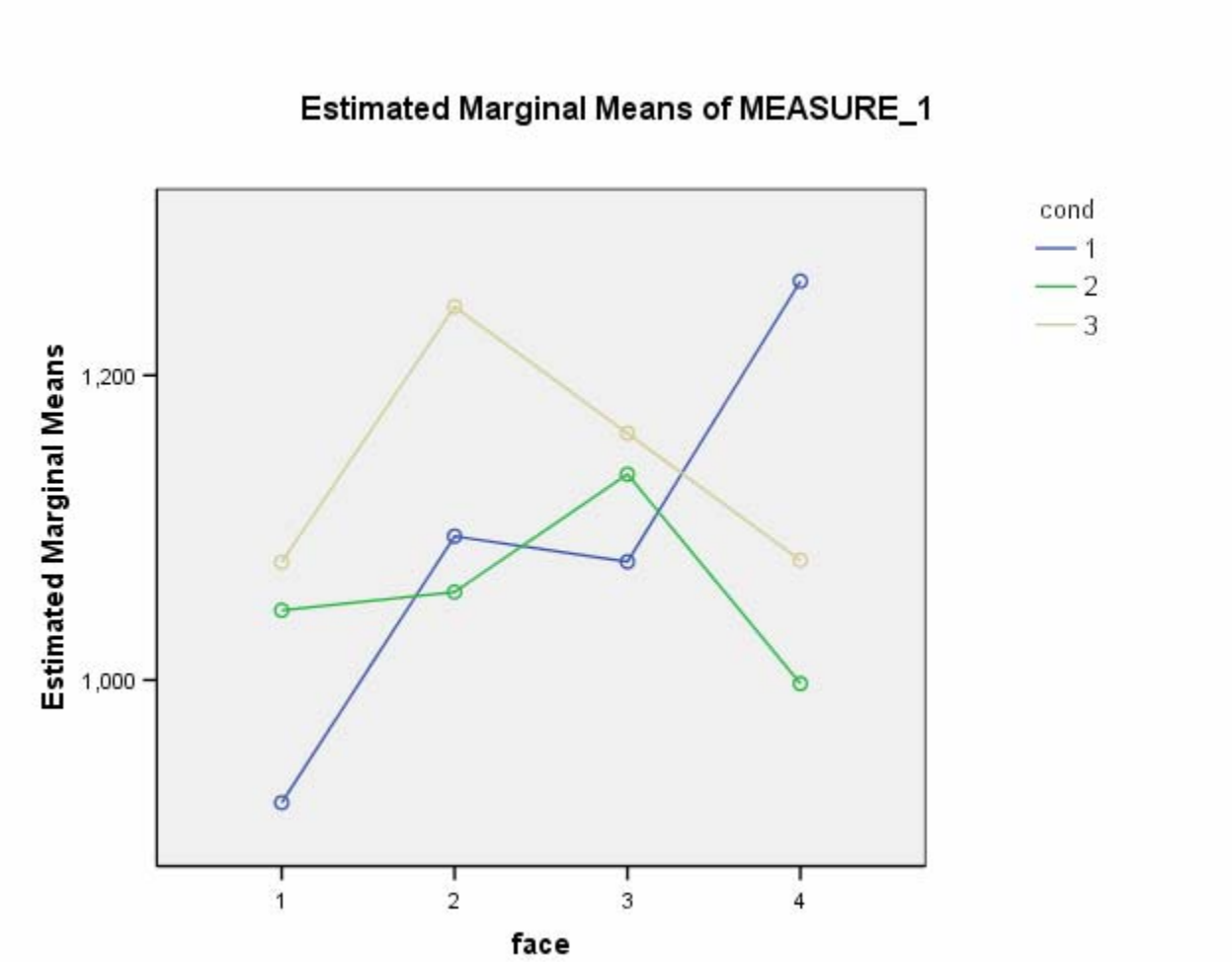

Figure 5. Word condition x face condition interaction. RT was slower in the incongruent condition when the eyes were removed. RT was longer in the congruent condition when the mouth was removed. RT was slower in the no word condition when the hairline was removed.

Discussion

This study was conducted to determine if the interference found by Koch (2005) was due to the removal of particular central features (i.e., the eyes and mouth) or simply due to the removal of any facial information. As in the previous study, no difference was found between the eyes removed and mouth removed conditions suggesting that the eyes and mouth are equally important for recognizing facial emotion. Additionally, the word x face interaction suggests that people may look at different facial features to determine facially expressed emotion under different conditions. For instance, the eyes may be most important for recognizing emotion under the most uncertain conditions while the mouth may be more important for confirming an emotion.

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