# The Role of the Eyes and Mouth in Facial Emotions

Christopher Koch
George Fox University

**Abstract**. Facial processing of emotions was examined using an emotional face Stroop task in which a face was presented with an emotion word. The expressed emotions included anger, sadness, happiness, and fear. In addition, the importance of facial features was examined by removing the eyes or mouth on some trials. Thus, there were three face conditions (full, eyes removed, mouth removed) and three word conditions (no word, congruent emotion, incongruent emotion). Twenty-seven students participated in the study. The results reveal a significant effect of face ($F(2, 52) = 4.63$, $p < .02$) and word conditions ($F(2, 52) = 9.57$, $p < .001$). Full faces produced significantly shorter RTs than did faces with either the eyes or mouth removed, but there were no differences between the eyes- and mouth-removed faces. Congruent emotion words did not produce facilitation but incongruent words produced significant interference. These findings suggest that the eyes and mouth are equally important in facial expressions of emotion.

## 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 presented with a face is to the eyes (Smith, Gosselin, and Schyns, 2004; Pearson, Henderson, Schyns, and Gosselin, 2003). The configuration of the eyes and mouth, in particular, plays a significant role in recognizing normal upright faces (Williams, Moos, and Bradshaw, 2004). Watanabe, Miki, & Kakigi (2005) found that eye and mouth movements are important for perceiving the facial expression of emotion and processed in the same brain area (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. This study was conducted to (1) examine the importance of the eyes and mouth in identifying emotions exhibited in facial expressions and (2) determine if an attentional paradigm (i.e., the Stroop task) can influence processing of facially expressed emotions.

## Method

*Participants*

Twelve male (five undergraduate and seven graduate) and 15 females (eight undergraduate and seven graduate) students volunteered to participate in the study. All participants had normal or corrected to normal visual acuity.

*Design*

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

Poster Presented at the 46th Annual Meeting of the Psychonomic Society
*Abstracts of the Psychonomic Society, 10*, 128.

(48 trials), a congruent emotion word (48 trials), or an incongruent emotion word (144 trials; Figure 2). In addition, three face conditions (complete face, eyes removed, mouth removed) were presented equal number of trials within each word condition.

Figure 1. Examples of happiness, fear, anger, and sadness from Ekman and Friesen.

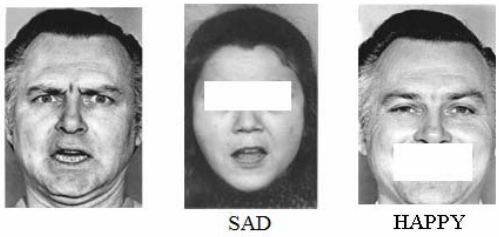


Figure 2. Example neutral, incongruent, and congruent word conditions with nothing removed, the eyes removed, and mouth removed.

*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.

## Results

Descriptive statistics for the nine face x word conditions are presented in Table 1. A repeated-measure ANOVA revealed main effects of face ($F(2, 52) = 4.63$, $p < .02$; $\eta^2 = .15$) and word ($F(2, 52) = 9.57$, $p < .001$; $\eta^2 = .27$) but no interaction between the two.

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

| Face x word | M | SD |
|---|---|---|
| Full face-no word | 1236.65 | 326.78 |
| Full face-congruent | 1162.28 | 320.62 |
| Full face-incongruent | 1397.30 | 326.65 |
| No eyes-no word | 1320.22 | 419.85 |
| No eyes-congruent | 1401.94 | 555.47 |
| No eyes-incongruent | 1430.91 | 421.88 |
| No mouth-no word | 1288.50 | 353.44 |
| No mouth-congruent | 1387.26 | 550.82 |
| No mouth-incongruent | 1467.89 | 355.15 |

In regard to faces, full faces (M = 1266.07, SE = 56.33) yielded the fastest RTs but there was no difference between the eyes- (M = 1384.36, SE = 79.11) and mouth-removed conditions (M = 1381.22, SE = 75.52; Figure 3). No difference was found between the no word (M = 1282.46, SE = 60.78) and congruent word conditions (M = 1317.16, SE = 79.64). However, the incongruent word condition (M = 1432.03, SE = 66.44) produced significantly longer RTs than the other word conditions (Figure 4). Thus, there was no Stroop facilitation but significant Stroop interference.

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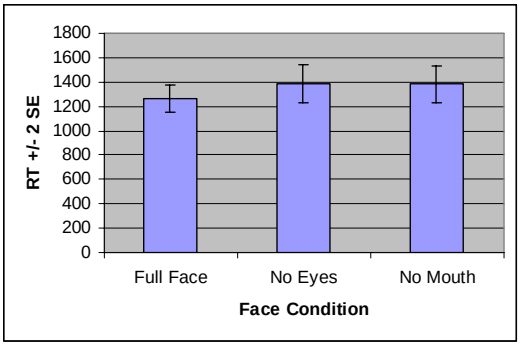


Figure 3. Mean differences between face conditions.

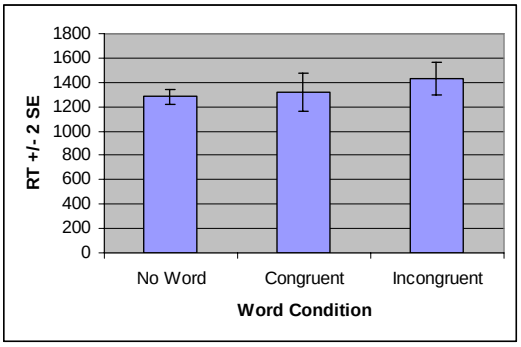


Figure 4. Mean differences between word conditions.

## Discussion

This study was conducted to examine the importance of the eyes and mouth in the facial expression of emotions using a Stroop paradigm. The results show an almost identical effect for removing the eyes and mouth. This finding suggests that the eyes and the mouth equally influence the perception of emotional facial expressions. Furthermore, faces in the incongruent condition produced longer RTs than the no word and congruent conditions indicating that attention, as manipulated in a Stroop paradigm, can influence processing of facially expressed emotions.

Research has shown developmental differences in face recognition. Children may focus more on the mouth and shift to the eyes as they age (c.f., Williams, Moss, and Bradshaw, 2004). Therefore, future research may examine developmental differences using the Stroop paradigm described in this study. Additionally, recent research has indicated that the eyebrows may be a significant component in facial processing (Sadr, Jarudi, and Sinha, 2003; Tipples, Atkinson, and Young, 2002; Want, Pascalis, Coleman, and Blades, 2003). Thus, future research can separate the eyebrows, eyes, and mouth using this Stroop paradigm.

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