

Top-Down Control of Attention During Judgments of Facial Expressions

Introduction

In the Moving Window Technique (MWT), the observer explores a blurry face using a mouse-controlled window to reveal detailed visual information. Previous research found a strong bias to explore the mouth of open-mouth expressions of emotion (Birmingham, Meixner, Iarocci, Kanan, Smilek, & Tanaka, In Press *Child Development*). In the present study, we used the MWT to examine the top-down attentional strategies employed by adult observers during facial emotion recognition. In one block, observers viewed open-mouth faces; in another block, observers viewed the same faces with closed mouths. We found that observers adapted their exploration strategy according to the amount of information provided by the mouths.

Method

Participants: Eleven adults aged 22-37 yrs, $M = 26.5$ yrs, $SD = 4.9$ yrs.
Stimuli: NimStim Set of Facial Expressions (Tottenham et al., 2009 *Psychiatry Research*). Eight exemplars (4 male, 4 female) were chosen for each of the 4 Emotions (Angry, Scared, Disgusted, Happy), in two Conditions (closed or open mouth). Faces were grayscale, blurred with a 40 pixel Gaussian filter and presented on a white canvas (1920 x 1080 pixels).

Procedure: There were 64 trials (32 faces x 2 Conditions). Conditions were counterbalanced across participants. Participants were instructed to explore a blurry face through a window controlled by the mouse (for up to 15s) to determine its emotion. Participants pressed the spacebar to terminate the trial. Emotion judgments were entered with a keypress.

Dependent Variables: Accuracy (proportion correct), Reaction Time (secs), and Proportion of Time spent exploring Regions of Interest (left eye, right eye, mouth, nose, face, and head). Proportion of Time was corrected for area differences between the regions.

Figure 1.
(A) The MWT
(B) Regions of Interest
(C) The four emotions presented in the present study



Conclusions

The present findings suggest that observers adjusted their exploration patterns depending on the information provided by the mouth. They spent more time exploring the mouth of open-mouth faces, and more time on the left eye of closed-mouth faces. In addition, observers adjusted their exploration patterns depending on the emotion of the face. They spent more time exploring the mouth on faces expressing disgust, a "lower" emotion, i.e., an emotion in which the optimal information is provided by the mouth (Smith et al., 2005 *Psychological Science*). When this optimal information was reduced (e.g., closed-mouth expressions of disgust), accuracy was compromised because observers were forced to rely on non-optimal information for this expression. These preliminary results suggest that participants strategically allocate their attention to optimal information for decoding facial expressions.

Results

Accuracy and Reaction Time

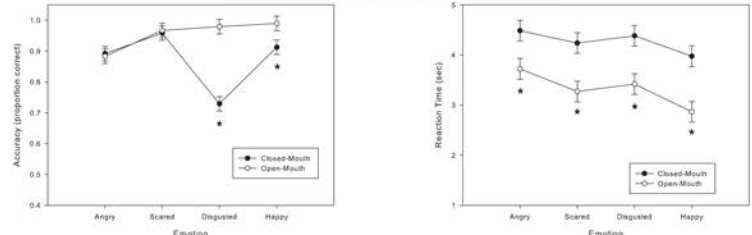


Figure 2. Accuracy (proportion correct) as a function of Condition and Emotion. Condition: Accuracy was lower for closed-mouth faces than for open-mouth faces, $p < 0.05$. The effect of Emotion was not significant ($p > 0.05$). Condition x Emotion: Accuracy was lower for closed-mouth faces, but only for Disgust and Happy expressions.

Figure 3. Reaction time (secs) as a function of Condition and Emotion. Condition: Reaction time was slower for closed-mouth faces than for open-mouth faces. The effect of Emotion, and the Condition by Emotion interaction, were not significant ($p > 0.05$).

Exploration Time

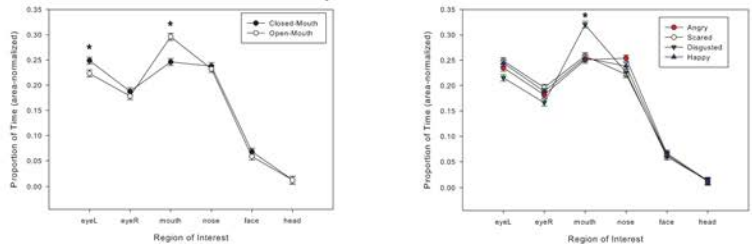


Figure 4. Proportion of Time in each Region as a function of Condition. Region: Mouth, left eye, and nose were explored the most, followed by the right eye, face, and finally the head (mouth = eyeL = nose > eyeR > face > head), $p < 0.05$. Condition x Region: Exploration of the left eye and the mouth differed across the closed-mouth and open-mouth faces. The mouth was explored longer on open-mouth faces than on closed-mouth faces, whereas the left eye was explored longer on closed-mouth faces than on open-mouth faces, $p < 0.05$. Exploration of the other regions did not differ between conditions.

Figure 5. Proportion of Time in each Region as a function of Emotion. The mouth was explored more, and both eyes were explored less, on Disgusted faces than on faces expressing other emotions. The nose was explored more on Angry faces than on Scared and Disgusted faces (Angry nose = Happy nose).

Heat Maps of Exploration Time

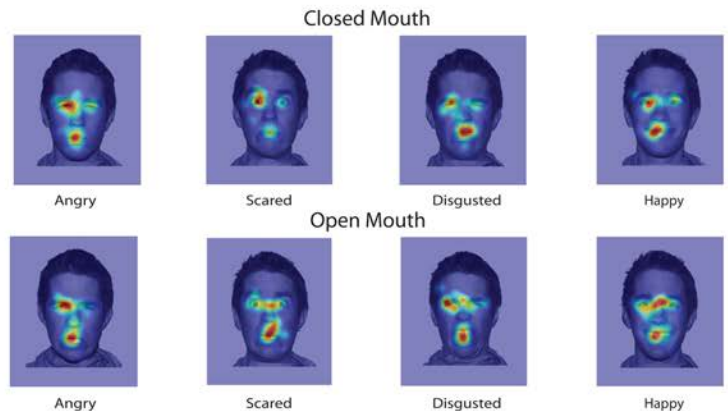


Figure 6. Heat maps illustrating exploration patterns for each Emotion and Condition. Each heat map is scaled from zero time (blue) to the point of maximal exploration time (red). Samples were smoothed with a 48-pixel Gaussian filter.