

# Mirror-reversal of a face is perceived as expressing emotions more intensely

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**This study examined hemispacial bias in a free-viewing condition of the judgement of facial expressions of emotions. Right-handed male subjects were asked to judge the intensity, in terms of expressiveness, of facial emotion in normal and mirror-reversed orientations. Expressions in mirror-reversed orientation were perceived as more intense than in normal orientation.**

**Keywords:** Face processing – Handedness – Emotional expression – Asymmetry

## INTRODUCTION

Neuropsychological research has shown that the left side of the face is more pronounced (as a function of the right hemisphere) during expressions of emotions in general (Sackeim *et al.*, 1978; Borod, 1990; Asthana and Mandal, 1996). Researchers in this field have also indicated that the perceiver's left hemiface falling on the side of expressor's hemiface (i.e. right) determines judgement about the structural functional resemblance with a whole face (Gilbert and Bakan, 1973; Moreno *et al.*, 1990; see also Christian and Hackworth, 1993). This is because the right hemisphere with its contralateral fibre projections to the left-visual-field largely mediates face processing (Borod *et al.*, 1990). Both speculations have ample empirical support, and it is possible that the hemifacial and hemispacial bias interact during face-to-face communication (Mandal and Singh, 1990). In such cases, the side of the face that is more pronounced during emotion expression is not the side the observer normally notices (Campbell, 1986; Sackeim *et al.*, 1978).

We believe therefore that the mirror-reversal of a facial expression (left-right) would be perceived as more intense in comparison to its normal orientation (right-left) because in such cases, the hemiface (left) dominant for emotion expression would be processed by the side of the hemisphere (left) that determines judgement about a whole face in a free-viewing condition. The hypothesis was tested in a simple experiment with certain methodological variations

from the earlier studies in which similarity judgement between test-target photographs (Gilbert and Bakan, 1973) or rating judgement for asymmetry of an expression (Borod *et al.*, 1990) were the dependent measures. In this study, subjects were asked to compare the normal and mirror-reversal orientation of a facial emotion in terms of its intensity of expression. To avoid the scanning bias accrued out of reading habit (left to right), the photographs were presented in upper and lower regions of the central - visual - field.

## METHOD

Forty right-handed male subjects (mean age 24.5 years  $\pm$  7.2; mean education 13.2  $\pm$  5.0) participated in the experiment. Subjects with an impaired sighting performance, a history of brain-disorder, or a history of psychiatric illness were not included. Handedness in subjects was assessed by a Hand Preference Inventory (Mandal, *et al.* 1992a).

A total of 20 full face photographs depicting expressions of happiness (five males and five females) and sadness (five males and five females), were selected from a series of photographs developed by Mandal (1987). (Photographs are available from microfiche publications, Documents NAPS D4267, POB, 3513, Grand Central Station, New York, NY 10017, USA.) The photographs were all standardized, clearly recognizable (over 70%), unblended with

other emotions, and located on a scale of intensity of expression. The faces depicted in the photographs were all unfamiliar to the subjects. For each selected photograph, two prints, one in normal orientation (RL) and the other in mirror-reversed (LR) orientation, were taken. Photographs were presented through a slide projector with the order of presentations counter-balanced. Subjects were instructed to look at the two photographs of an expression (RL and LR) and prefer one (top or bottom) in a forced-choice response format that displayed the intended emotion more intensely.

## RESULTS

The frequency of preference for RL or LR of a facial emotion was the dependent measure (Table I).

TABLE I. Preferred judgements of expression for photographs presented in normal and mirror-reversed orientation

Direction of preference	Number of preferred emotions <sup>1</sup>	
	Happy	Sad
Mirror-reversed orientation (LR)	225 (56.25%)	233 (58.25%)
Normal orientation (RL)	175 (43.75%)	167 (41.75%)

<sup>1</sup>Total judgements 400 (40 subjects, 10 photographs each).

A laterality ratio, calculated as preference for LR minus preference for RL divided by the total number of preferences (Bryden, 1982), was calculated for each subjects judgement. The mean laterality ratio was calculated as happy = + 0.14, sad = + 0.17, indicating a preference for LR over RL. Photographs presented in LR orientation were judged as significantly more intense than those in RL,  $F(1,78) = 20.17, p < 0.01$ . The main effect of emotion could not be tested in the factorial ANOVA of Emotion  $\times$  Facial orientation because the total number of preferences was identical for both the emotions (happy, sad). The interaction of Emotion  $\times$  Facial orientation was non-significant.

A separate analysis was done to identify the emotion effect in which expressions of LR orientation were found to have been judged more intense than RL orientation for happy ( $\chi^2 = 6.25, df = 1, p < 0.01$ ) as well as sad ( $\chi^2 = 10.88, df = 1, p < 0.01$ ) emotions.

## DISCUSSION

There is ample evidence that the left of the face is more dominant than the right in expression of

emotion (see Borod *et al.*, 1990), and a perceiver's left-visual-field rather than right-visual-field is more dominant in judgement about a whole face (see Campbell, 1986).

The present findings indicate that the dominant facial side (left) presented to the dominant perceiver side (left) was judged as more intense than the dominant facial side presented to the non-dominant perceiver side (right) or conversely the non-dominant facial side to the dominant perceiver side. The findings corroborate the observations of Borod and her associates (Borod *et al.*, 1990) in 'which expressions viewed in the reversed orientation were rated as more left sided than in the normal orientation'. Given such a finding, the question arises as to why the dominant side of an expressor's face is processed by the non-dominant perceiver side of an observer during normal social interactions. Earlier speculations that 'the left of face is more private/emotional whereas the right is more public/communicative' (Wolff, 1933) have been supported by researchers at a later date (Sackeim *et al.*, 1978; Mandall *et al.*, 1992b) and the impact of lateralization of facial expression on the attribution of personality (Kowner, 1995) and facial attractiveness with its possible evolutionary basis (Zaidel *et al.*, 1995) was evaluated. These findings give rise to two possibilities. First, we learn in the course of human development to civilize intense emotional expressions of subcortical origin by the side of the face (right) which is more under the voluntary motor control of the relatively less emotional side of the cerebral hemisphere (i.e. left) for the facility of social interaction. Second, we evolve a strategy in the course of civilization to process the emotionally pronounced side of the face (left) by the hemisphere side (left) that largely mediates cognitive ability, and is non-dominant for emotional processing (right-visual-field) with an ultimate aim to allow us to have a 'temporal priority of cognition over emotion' (Lazarus, 1984).

These assumptions are, however, purely speculative and need support from other empirical findings.

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