OPEN ACCESS

Short Report

Symmetries in a standardized set of emotional facial expressions (JACFEE)

Symmetrien in einem standardisierten Satz emotionaler Gesichtsausdrücke (JACFEE)

Henrik Kessler[1]
Franziska Bachmayr[1]
Steffen Walter[1]
Holger Hoffmann[1]
Suzanne Filipic[1]
Harald C. Traue[1]

1 University Clinic for Psychosomatic Medicine and Psychotherapy, Medical Psychology, Ulm, Germany

Abstract

Objective: To investigate possible asymmetry in a widely used set of standardized emotional facial expressions (JACFEE, Japanese and Caucasian Facial Expressions of Emotion).
Method: Chimeric pictures with either two left (LL) or two right (RR) halves of the emotional face were produced from the original set and presented to healthy subjects who rated their intensity.
Results: With the exception of "happiness", for all other emotions (sadness, disgust, anger, fear and surprise) LL and RR composites were given comparable intensities, speaking for high symmetry in the faces.
Conclusions: The JACFEE facial emotion pictures are mostly symmetrical, possibly due to their standardisation procedure when producing the pictures.

Keywords: facial expressions of emotion, JACFEE, facial asymmetry, chimeric faces

Zusammenfassung

Ziel: Mögliche Asymmetrien in einem weit verbreiteten Satz emotionaler Gesichtsausdrücke zu untersuchen (JACFEE, Japanese and Caucasian Facial Expressions of Emotion).
Methoden: Chimären-Portraits mit entweder zwei linken (LL) oder zwei rechten (RR) Gesichtshälften des emotionalen Ausdrucks wurden aus dem Original-Bildsatz hergestellt und einer Gruppe gesunder Probanden gezeigt, die deren Intensität einschätzten.
Ergebnisse: Mit der Ausnahme von „Freude", wurden bei allen anderen Emotionen (Traurigkeit, Ekel, Ärger, Angst und Überraschung) die LL und RR Chimären mit vergleichbarer Intensität eingeschätzt. Dies spricht für die hohe Symmetrie der Gesichter.
Schlussfolgerung: Der JACFEE Bildsatz emotionaler Gesichter ist überwiegend symmetrisch. Dies könnte am standardisierten Verfahren der Bilderzeugung liegen.

Schlüsselwörter: emotionale Gesichtsausdrücke, JACFEE, Gesichtsasymmetrie, Chimären-Portraits

Introduction

Photographs of facial expressions of emotion constitute important stimuli for different fields of research, ranging from basic emotion studies to applied clinical investigations [1], [2]. When presenting facial emotions to subjects it is of utmost importance to have profound knowledge of the material used, i.e. to know basic components of the stimuli that influence their perception and recognisability. One of these components is the issue of facial asymmetry. It is assumed that faces generally are asymmetrical leading to differing portraits when composing "new" faces of two identical halves (so-called chimeras) [3], [4], [5]. Furthermore it is stated based on reviews that the left hemiface displays emotions more intensely than the right hemiface [6], [7], [8]. Although this general statement might hold true on the level of meta-analyses, there is surprising heterogeneity, when looking at single studies. There is empirical evidence speaking for greater left [9], [10] as well as right [11] hemiface expressiveness, and there are also reports of no differences [12], [13]. It is noticeable that studies differ greatly in their

Table 1: Intensity ratings (in percent) for LL and RR composites across emotions (n=79) and group comparison using Wilcoxon-Tests (Z)

Emotion	Side	Mean	SD	Z	P
Anger	LL	79.6	12.3	**-.139**	.889
	RR	79.8	11.4		
Disgust	LL	63.9	15.0	**-.139**	.889
	RR	63.7	14.8		
Fear	LL	78.7	14.2	**-1.223**	.221
	RR	77.6	13.4		
Happiness	LL	79.2	10.9	**-3.752**	<.001
	RR	74.2	11.6		
Sadness	LL	60.6	15.3	**-.222**	.824
	RR	60.6	15.5		
Surprise	LL	79.1	13.2	**-1.905**	.057
	RR	77.3	13.7		

SD = standard deviation

methods and stimuli which were used. Production methods range from giving clear instructions to actors to produce an emotional expression to idiosyncratic photographs of laymen portraying what they might think is an emotion. Some actors "feel" the emotion, others only pose their facial muscles to portray the emotion. Quality of photographs (lighting, viewing angle, background) and physiognomy of actors also vary greatly. Subtle facial cues like wrinkles and make-up are believed to inflate asymmetries and hence influence emotion recognition [14]. Before using facial stimuli to assess emotion recognition, the issue of asymmetry should thus be considered for the material at hand.

The aim of this methodological study was to thoroughly investigate possible asymmetry in a well-known and widely used stimulus set of facial affect, the JACFEE series (Japanese and Caucasian Facial Expressions of Emotion, [15]). This highly standardized and reliable colour image set [16] shows actors portraying one of six emotions (happiness, anger, fear, sadness, disgust and surprise). Actors have been instructed to move their facial muscles according to the Facial Action Coding System (FACS) [17], except for happiness, where pictures were taken when the actors smiled spontaneously.

Methods

To test for facial asymmetries so-called composites consisting of either two left or two right hemifaces were produced. Original JACFEE pictures were vertically divided in two halves to separate the left and right hemiface. Then the original hemiface and its respective mirror image were put together to create composites consisting either of two left (LL) or of two right hemifaces (RR). A considerable effort was made to eliminate technical artefacts (tilt, lighting, varying intensities or image size) during the stimulus production. Four images from this set (2 male & 2 female) were selected for each emotion, resulting in a total number of 48 images (6 emotions × 4 actors × 2 composites). Figure 1 shows examples of original and composite faces for happiness, fear and disgust.

One widely used approach to test for facial asymmetries is to show LL- and RR-composites and let judges rate the intensity of the expressions. Differences between mean judged intensities of LL- and RR-composites argue for the respective left or right hemiface asymmetry. We tested 158 healthy volunteers (mean age 23.0 years, SD: 6.5 years, 66% female) who saw the composite faces based on the JACFEE set and asked them to rate their intensity. Subjects were recruited from the student population of the University of Ulm and the community. They all gave written informed consent. Half of the subjects (n=79) saw chimeric faces expressing anger, sadness and surprise. The other half judged faces displaying disgust, fear and happiness. Each image could be rated on a 5-point likert scale from 20 (low intensity) to 100 (high intensity), suggesting percentage of intensity in 20% steps. Each stimulus was presented for exactly 2500 ms. The order of presentation was completely randomized (emotions & images).

Results

Table 1 shows mean intensity ratings divided by emotion and composite. Only for happiness, LL composites were judged to be more intense ($p<.001$). For the other five emotions, there were no significant differences between LL and RR composites. For the four actors showing happiness, all pairs showed that the LL composite was judged as more intense. Intensity ratings followed a normal distribution across all emotions and varied between 28% and 100% (mean 72.9; SD 14.6). Differences in intensity rating among emotions were significant (ANOVA: $F=43.030$, $p<.001$).

Figure 1: Examples of chimeric faces showing the emotion happiness (top), fear (middle) and disgust (bottom): (a) original image taken from the JACFEE set, (b) LL-composite, (c) RR-composite

Discussion

Our results show clearly that for anger, disgust, sadness, fear and surprise, the JACFEE pictures are symmetrical in terms of intensity judged by observers. For happiness there is a significant but rather small difference in absolute numbers speaking for greater expressiveness of the left hemiface. Therefore the high level of standardization applied when producing the JACFEE set seems to lead to symmetrical stimuli. Asymmetry effects observed for other facial affect stimuli should thus be irrelevant when using the JACFEE set in emotion recognition studies. It is interesting that happiness, the only expression that was displayed spontaneously by actors ("felt happiness"), is the only emotion with (moderate) asymmetry effects. Looking at Figure 1, more pronounced eye-wrinkles ("crow's feet") in the LL-composite could be one cause for the perceived greater expressiveness. Activity in the muscles orbiting the eye is part of the so-called Duchenne smile, which is believed to be genuine and reflect felt happiness [18]. Additionally, there have been previous reports of greater expressiveness of smiling in general

on the left hemiface [19]. This strengthens the assumption that it might have been the standardisation procedure (FACS instructions) that caused the symmetry in all other emotions. When people express their emotions spontaneously, idiosyncrasies and lack of voluntary facial control might cause asymmetries. Consequently, this could have implications for the ecological validity of stimuli.

Notes

Conflicts of interest

None declared.

References

1. Braun M, Traue HC, Frisch S, Deighton RM, Kessler H. Emotion recognition in stroke patients with left and right hemispheric lesion: Results with a new instrument-the FEEL Test. Brain Cogn. 2005;58(2):193-201.
2. Calder AJ, Keane J, Manly T, Sprengelmeyer R, Scott S, Nimmo-Smith I, Young AW. Facial expression recognition across the adult life span. Neuropsychologia. 2003;41(2):195-202.
3. Zaidel DW, Aarde SM, Baig K. Appearance of symmetry, beauty, and health in human faces. Brain Cogn. 2005;57(3):261-3.
4. Wolff W. The expression of personality. New York: Harper; 1943. 5. Gilbert C, Bakan P. Visual asymmetry in perception of faces. Neuropsychologia. 1973;11(3):355-62.
5. Gilbert C, Bakan P. Visual asymmetry in perception of faces. Neuropsychologia. 1973;11(3):355-62.
6. Campbell R. Asymmetries of facial action: Some facts and fancy of normal face movement. In: Bruyer R, ed. The Neuropsychology of Face Perception and Facial Expression. Hillsdale, NJ: Erlbaum; 1986. p. 247-67.
7. Skinner M, Mullen B. Facial asymmetry in emotional expression: A meta-analysis of research. Br J Soc Psychol. 1991;30(2):113-24.
8. Borod JC, Haywood CS, Koff E. Neuropsychological aspects of facial asymmetry during emotional expression: a review of the normal adult literature. Neuropsychol Rev. 1997;7(1):41-60.
9. Sackeim HA, Gur RC, Saucy MC. Emotions are expressed more intensely on the left side of the face. Science. 1978;202(4366):434-6.
10. Indersmitten T, Gur RC. Emotion processing in chimeric faces: hemispheric asymmetries in expression and recognition of emotions. J Neurosci. 2003;23(9):3820-5.
11. Schiff BB, MacDonald B. Facial asymmetries in the spontaneous response to positive and negative emotional arousal. Neuropsychologia. 1990;28(8):777-85.
12. Cacioppo JT, Petty RE. Lateral asymmetry in the expression of cognition and emotion. J Exp Psychol Hum Percept Perform. 1981;7(2):333-41.
13. Strauss E, Kaplan E. Lateralized asymmetries in self-perception. Cortex. 1980;16(2):289-93.
14. Hager JC, Ekman P. The Inner and Outer Meanings of Facial Expressions. In: Cacioppo JT, Petty RE, eds. Social Psychophysiology: A Sourcebook. New York: The Guilford Press; 1983. p. 348-56.
15. Matsumoto D, Ekman P. Japanese and Caucasian Facial Expressions of Emotion (JACFEE) and Neutral Faces (JACNeuF). [Slides]: Dr. Paul Ekman, Department of Psychiatry, University of California, San Francisco, 401 Parnassus, San Francisco, CA 94143-0984; 1988.
16. Biehl M, Matsumoto D, Ekman P, Hearn V, Heider K, Kudoh T, Ton V. Matsumoto and Ekman´s Japanese and Caucasian Facial Expressions of Emotion (JACFEE): Reliability Data and Cross-National Differences. J Nonverbal Behav. 1997;21:2-21.
17. Ekman P, Friesen WV. Facial Action Coding System. Palo Alto: Consulting Psychologists Press; 1978.
18. Ekman P, Davidson RJ, Friesen WV. The Duchenne smile: emotional expression and brain physiology. II. J Pers Soc Psychol. 1990;58(2):342-53.
19. Zaidel DW, Chen AC, German C. She is not a beauty even when she smiles: possible evolutionary basis for a relationship between facial attractiveness and hemispheric specialization. Neuropsychologia. 1995;33(5):649-55.

Corresponding author:
Dr. Henrik Kessler
University Clinic for Psychosomatic Medicine and Psychotherapy, Medical Psychology, Am Hochstraess 8, 89081 Ulm, Germany
henrik.kessler@uni-ulm.de

Please cite as
Kessler H, Bachmayr F, Walter S, Hoffmann H, Filipic S, Traue HC. Symmetries in a standardized set of emotional facial expressions (JACFEE). GMS Psychosoc Med. 2008;5:Doc09.

This article is freely available from
http://www.egms.de/en/journals/psm/2008-5/psm000054.shtml

Published: *2008-08-13*