Ann. Zool. Fennici 46: 75–80 ISSN 0003-455X (print), ISSN 1797-2450 (online)
Helsinki 27 February 2009

Dress for success: human facial expressions are important signals of emotions

Mare Lõhmus[1,*], L. Fredrik Sundström[2] & Mats Björklund[1]

[1)] *Department of Animal Ecology, EBC, Uppsala University, Norbyvägen 18 D, SE-752 36 Uppsala, Sweden (*corresponding author's e-mail: mare.lohmus@ebc.uu.se)*
[2)] *Department of Zoology, Göteborg University, Box 463, SE-405 30 Göteborg, Sweden*

Received 8 Aug. 2008, revised version received 5 Nov. 2008, accepted 4 Nov. 2008

Lõhmus, M., Sundström, L. F. & Björklund, M. 2009: Dress for success: human facial expressions are important signals of emotions. — *Ann. Zool. Fennici* 46: 75–80.

In order to test how emotions affect individual neutral facial expressions and the reliability of humans to read these expressions, we photographed faces of 25 women wearing clothes in which they felt attractive, unattractive, or comfortable while expressing an emotionally neutral face. Men found the faces of women in attractive clothes the most attractive, whereas the faces of women in comfortable and unattractive clothes were ranked as intermediate and least attractive, respectively, even though the clothes were not visible in the photographs. Our results demonstrate that despite very subtle effects, the emotional state of women is perceived by men and that the two sexes are concordant on the signal sent and received. We show a close connection between exterior attributes, confidence, and how a person is perceived by others.

Introduction

Human faces provide not only information on identity, gender and age but also on emotional state of the individual. Among all primates, facial expressions are important signals of internal states and the ability to understand facial expressions is essential in social interactions (Mueller & Mazur 1997, Herba & Phillips 2004, Burrows *et al*. 2006). In 1872, Charles Darwin wrote that certain facial expressions of emotions are adaptive for behavioral purposes and are therefore innate, automatic and universal (Darwin 1965). His postulate has been supported by studies demonstrating that children as young as a few months are able to discriminate between happy, sad and surprised faces and that generally this capacity is culture independent (Ekman & Friesen 1971, Herba & Phillips 2004, Venn *et al*. 2006). Moreover, the ability to recognize facial expressions improves with age (Herba & Phillips 2004) implying a growing importance of comprehending non-vocal signals in adulthood.

Honest signaling is a common theme in sexual selection (Grafen 1990). Several kinds of ornaments have developed in many organisms to signal both the internal qualities and the perceptivity in mate choice situations (Berglund *et al*. 1996). Honesty in facial signals that allows a receiver to correctly understand the emotion of the sender should be evolutionarily advantageous in situations where misinterpretation of the emotions entails a cost. In the context of mate choice, many costs (both emotional and material) may be avoided by both sending and correctly interpreting facial expressions.

But how reliable is the human capacity to read facial expressions? It is quite clear that people sometimes read more into an expression than what is there, and so go beyond the inferences afforded by facial appearances and instinctively make conclusions about a person's disposition (Todorov *et al*. 2005). According to Todorov *et al*. (2005) even situations, such as political voting, which are assumed to be based on rational and deliberative considerations, are strongly influenced by quick and unreflective trait inferences of candidates. On the other hand, as observed by Little and Perett (2007), people do perform better than chance at guessing each other's personality from only facial information, which provides further support to the idea that the perception of facial traits is an adaptive ability of evolutionarily importance.

So what is it that makes a face likable or attractive? It only takes a moment to judge attractiveness of a human face; still its expressional information can be influenced by several factors. Today, most studies investigating the attractiveness of a female face have focused on hormonal/menstrual cycle effects that influence facial attractiveness (Johnston *et al*. 2001, Fisher 2004, Roberts *et al*. 2004, Johnston 2006). In this paper, we report how the emotional state of women influences the response of men evaluating the attractiveness of the females' faces. The women's emotional state was evoked by their choice of clothes. Clothing plays an important part in human society around the world (Hansen 2004) and is used consciously to decorate the body in mate-attraction situations (Grammer *et al*. 2004). Both men and women largely agree on what is considered attractive clothing and women feel more attractive when using clothes perceived by men as attractive (Edmonds & Cahoon 1984). Therefore, the feeling of the wearer may be closely connected to the type of clothes worn. We allowed women to dress in three different outfits, in which they felt attractive (the "sexy outfit"), comfortable (e.g. loose soft pants and sweatshirts) and unattractive (typically "unfashionable" or too tight). Women chose their outfits by themselves. We then asked the women to have a neutral facial expression and photographed only the face. Next, men rated the three photographs of each woman in terms of attractiveness. We expected the clothes to influence the emotional state of the wearer, and the men to respond to the emotions of the women and rate the faces of the women feeling attractive in attractive clothing higher than women in "unattractive clothing".

Methods

The faces of 25 female volunteers between the ages of 22 and 28 years old, living in the city of Gothenburg in Sweden, were photographed with a digital camera individually in a home milieu when the women were wearing clothes in which they felt (1) attractive, (2) unattractive and (3) comfortable. The clothes were exclusively chosen by the woman being photographed making her feelings more reliable than if she had been provided unfamiliar outfits. The women where asked to choose the clothes in advance giving them time to think trough the possible emotional influence of each outfit. The women were asked to have a neutral facial expression and always look in the same direction when the photographs were taken to avoid effects caused by differences in smiles or eye contact. Photographs were always taken by the same female photographer and in random order across women. Hair style and makeup remained the same in all three photographs to avoid effects not related to clothing (Mehrabian & Blum 1997, Mesko & Bereczkei 2004). None of the women participating in this study had any before-hand information about the goals of the experiment and no personal interest in the results. However it cannot be totally ruled out that some of them partly guessed the purpose of the study. No female participants had a history in psychology research and most of them were undergraduate students from various university programs in Gothenburg.

The three images of each woman were printed in color on an A4 page and positioned randomly at the A, B, and C position (Fig. 1). Twenty four women also rated their self-confidence and their comfort of being photographed after the pictures were taken on a scale between 1 and 10 where 10 is high confidence or comfort.

Pages with images of the 25 women were shown to 49 randomly chosen heterosexual men

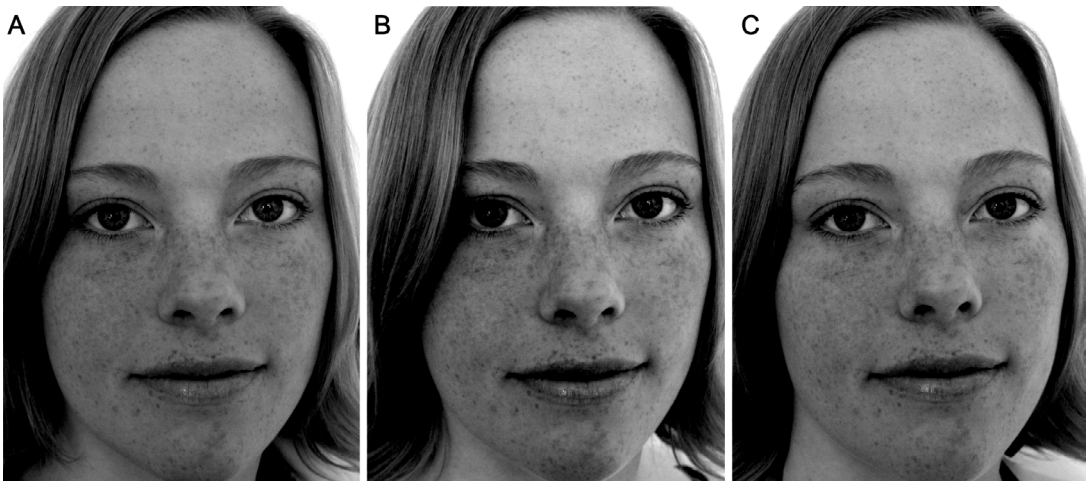

Fig. 1. Example of the three photographs of a woman dressed in clothes that she felt made her (**A**) attractive, (**B**) comfortable and (**C**) unattractive. Original photographs of the 25 women presented for evaluators where printed in colour.

in the age of 21–64 years (35.8 ± 10 SD) who had never before seen any of the women. The men were asked to rank the three images of each woman in order of attractiveness. The image considered the least attractive was given rank 1 and the image considered the most attractive was given rank 3. After ranking the three photographs of the 25 women (within the same individual), each man filled out a questionnaire asking for marital status (single, in a relationship, or married/common law) and age.

The ranks given to all photographs where the women felt attractive, unattractive, and comfortable were summed for each man. In this way, every man provided three input values. The first value was the sum of ranks given to photographs of women dressed in attractive clothes, the second value corresponded to photographs of women dressed in unattractive clothes, and the last value corresponded to comfortable clothes. Thus, we had three rank sums from each of 49 men reflecting the men's opinion on the faces of women dressed in the three types of clothes.

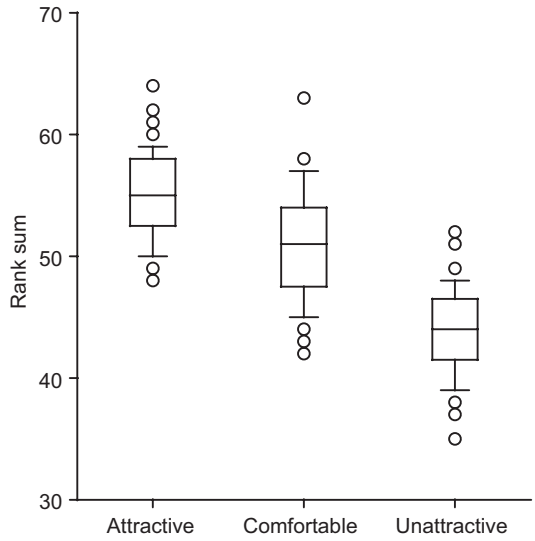

Fig. 2. Rank sum from 49 men judging the attractiveness of images showing only the faces of 25 women dressed in clothes that made them feel attractive, comfortable, and unattractive. Centerlines of boxes are median, boxes are 25th and 75th percentiles, whiskers are 10th and 90th percentiles, and filled circles are outliers.

Results

The face considered to be the most attractive by men was the one in which the women were dressed in clothes that made them feel attractive (Fig. 2; Friedman two-way ANOVA: $\chi^2 = 57.8$, $df = 2$, $p < 0.001$). The photographs taken with comfortable clothes were also rated as more attractive than those taken when wearing unattractive clothes [post-hoc comparison rank difference 0.6, $p < 0.01$ (Siegel & Castellan 1988)]. Marital status of the men had no effect on their

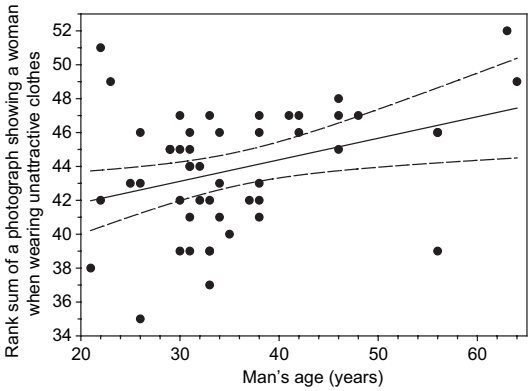

Fig. 3. Correlation between age of men and their rank sum for the image of faces of women dressed in clothes that they themselves felt made them unattractive. Spearman $r_{49} = 0.29$, $p = 0.045$.

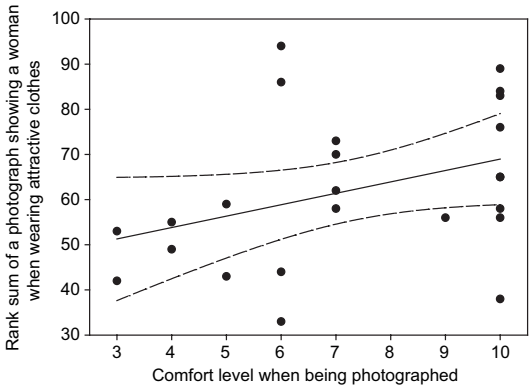

Fig. 4. Correlation between the women's comfort of being photographed and rank sum for the photograph in which they wore clothes in which they felt attractive. Spearman $r_{24} = 0.44$, $p = 0.032$.

ranking of the photographs (Kruskal-Wallis: $\chi^2 = 1.5$, df = 2, $p = 0.48$ for the unattractive photograph and less of an effect for the other two types) but older men discriminated less against the pictures taken with non-attractive clothes as compared with younger men (Fig. 3). Women that reported feeling confident when being photographed were ranked as more attractive when wearing attractive clothes than the women that did not feel comfortable (Fig. 4).

Discussion

There is good reason to assume that the human face plays an adaptive role in social cognition. Human faces are visible in most social interactions and frequently provide us with an important source of information (Hassin & Trope 2000). People use this information to "assess" their target and approach him/her according to their perceptions. Communication between people is largely conveyed via the face (Ioannou *et al*. 2005) and it has been shown that people are not able to ignore facial information even when they are supposed to make neutral decisions and are specifically asked to ignore the facial appearance (Hassin & Trope 2000, Todorov *et al*. 2005). Furthermore, social psychology research postulates that human conversations are more dominated by facial expressions indicating speaker's predisposition towards the listener, than by the spoken words (Ioannou *et al*. 2005).

Our study demonstrated an inability of human females to conceal their perception of self by adopting a "neutral" facial expression. Women's self image, either "ugly" or "attractive" was manipulated by their choice of clothes and presumably resulted in subtle differences in facial expressions. The ability of men to detect these differences in presented "neutral" appearances emphasizes the importance of non-vocal intersexual communication in humans (Darwin 1965) and demonstrates the ability of humans to detect very slight facial expression differences.

Several studies suggest that humans are predisposed to react to facial stimuli both emotionally and with corresponding facial expressions (Dimberg 1997). Dimberg *et al*. (2000) demonstrated that people unconsciously exposed to pictures of happy and angry faces still reacted with distinct facial muscle movements that corresponded to the happy or angry stimulus faces. Accordingly, reactions to facial expressions are thought to be rather spontaneous and independent of conscious cognitive processes (Dimberg 1997, Dimberg *et al*. 2000). The perception by men in this study was likely subconscious considering their spontaneous and frequently used phrase "but there is no difference among these photos". Men being able to detect very subtle differences between observed facial images and to connect them to women's feelings, suggest that women were transmitting a signal of internal confidence that was "correctly" picked up by the evaluating men. Most likely, this signal was gen-

erated, transmitted and received with very little involvement of conscious cognitive processes.

The level of attributional confidence is an important factor for the quality of human social contact (Beaupre & Hess 2006). In the present study, women, feeling confident during photographing, were ranked as more attractive when wearing attractive clothes than the women that did not feel comfortable. This result accentuates the importance of underlying honesty of facial expression which seems to facilitate the comprehension of an expression. It also demonstrates the importance of high-self esteem in context of attractiveness.

Several experiments have shown that facial cues that provide accurate information about experienced emotions are rather subtle. For example, distinguishing between honest and fake smiles is only possible through detection of minor muscular differences in a face, as an honest smile usually activates the outer muscles orbiting the eye and a fake one contains traces of muscular activity associated with negative emotions (Ekman *et al*. 1997). In the present experiment, the women were asked to pose in outfits that affected their internal state in various ways and then mask their true emotions by adopting a neutral facial expression. It certainly seems as, even if the women did mask their facial macro-expressions, the micro-expressions were still present and perceived by observers.

We observed a weak trend of older men showing less preference for the faces of women wearing attractive clothing. Humans use different areas of the brain to process facial emotions at different ages and have different ways of using the posterior hemisphere in the process (Pine *et al*. 2001, Gunning-Dixon *et al*. 2003). As such, there might be a neurological explanation for the observed trend affecting the judgment of attractiveness by older men. It is also possible that some social indoctrination, such as believing that it would be easier to woo a younger woman that doesn't appear to be too aware of her attractiveness, influenced the decisions of older men.

Our data demonstrate a close connection between exterior attributes, internal confidence, and how a person is perceived by others. The feeling of attractiveness and confidence appears to influences subconscious facial expressions in women and these can be perceived accurately by the opposite sex. These abilities are likely to play an important role in our daily social interactions and possibly affect success in events such as job interviews and mate attraction, as well as influence social position.

Acknowledgements

We are very thankful to Dursuma Medic for efficiently recruiting models and taking the photographs. We also thank all the women that agreed to be photographed for this study, in particular Sofia for allowing us to use her photographs for Fig. 1, and the men that with varying degrees of excitement volunteered to score the photos.

References

Beaupre, M. G. & Hess, U. 2006: An ingroup advantage for confidence in emotion recognition judgments: the moderating effect of familiarity with the expressions of outgroup members. — *Personality and Social Psychology Bulletin* 32: 16–26.

Berglund, A., Bisazza, A. & Pilastro, A. 1996: Armaments and ornaments: an evolutionary explanation of traits of dual utility. — *Biological Journal of the Linnean Society* 58: 385–399.

Burrows, A. M., Waller, B. M., Parr, L. A. & Bonar, C. J. 2006: Muscles of facial expression in the chimpanzee (*Pan troglodytes*): descriptive, comparative and phylogenetic contexts. — *Journal of Anatomy* 208: 153–167.

Darwin, C. 1965: *The expression of emotion in man and animals*. — University of Chicago Press, Chicago.

Dimberg, U. 1997: Psychophysiological reactions to facial expressions. — In: Segerstråle, U. & Molnár, P. (eds.), *Nonverbal communication: where nature meets culture*: 47–60. Lawrence Erlbaum Associates, Mahwah.

Dimberg, U., Thunberg, M. & Kurt, E. 2000: Unconcious facial reactions to emotional facial expressions. — *Psychological Science* 11: 86–89.

Edmonds, M. A. & Cahoon, D. D. 1984: Female clothes preference related to male sexual interest. — *Bulletin of the Psychonomic Society* 22: 171–173.

Ekman, P. & Friesen, W. 1971: Constant across cultures in the face and emotion. — *Journal of Personality and Social Psychology* 17: 124–129.

Ekman, P., Friesen, W. V. & O'Sullivan, M. 1997: Smiles when lying — In: Ekman, P. & Rosenberg, E. L. (eds.), *What the face reveals: basic and applied studies of spontaneous expression using the facial action coding system (FACS)*: 201–216. Oxford University Press, US.

Fisher, M. L. 2004: Female intrasexual competition decreases female facial attractiveness. — *Proceedings of the Royal Society of London B* 271: S283–S285.

Grafen, A. 1990: Biological signals as handicaps. — *Journal*

of Theoretical Biology 144: 517–546.

Grammer, K., Renninger, L. & Fischer, B. 2004: Disco clothing, female sexual motivation, and relationship status: is she dressed to impress? — *Journal of Sex Research* 41: 66–74.

Gunning-Dixon, F. M., Gur, R. C., Perkins, A. C., Schroeder, L., Turner, T., Turetsky, B. I., Chan, R. M., Loughead, J. W., Alsop, D. C., Maldjian, J. & Gur, R. E. 2003: Age-related differences in brain activation during emotional face processing. — *Neurobiology of Aging* 24: 285–295.

Hansen, K. T. 2004: The world in dress: anthropological perspectives on clothing, fashion, and culture. — *Annual Review of Anthropology* 33: 369–392.

Hassin, R. & Trope, Y. 2000: Facing faces: studies on the cognitive aspects of physiognomy. — *Journal of Personality and Social Psychology* 78: 837–852.

Herba, C. & Phillips, M. 2004: Annotation: development of facial expression recognition from childhood to adolescence: behavioural and neurological perspectives. — *Journal of Child Psychology and Psychiatry* 45: 1185–1198.

Johnston, V. S. 2006: Mate choice decisions: the role of facial beauty. — *Trends in Cognitive Sciences* 10: 9–13.

Johnston, V. S., Hagel, R., Franklin, M., Fink, B. & Grammer, K. 2001: Male facial attractiveness: evidence for hormone-mediated adaptive design. — *Evolution and Human Behavior* 22: 251–267.

Little, A. C. & Perrett, D. I. 2007: Using composite images to assess accuracy in personality attribution to faces. — *British Journal of Psychology* 98: 111–126.

Mehrabian, A. & Blum, J. S. 1997: Physical appearance, attractiveness, and the mediating role of emotions. — *Current Psychology* 16: 20–42.

Mesko, N. & Bereczkei, T. 2004: Hairstyle as an adaptive means of displaying phenotypic quality. — *Human Nature — An interdisciplinary Bioscosial Perspective* 15: 251–270.

Mueller, U. & Mazur, A. 1997: Facial dominance in *Homo sapiens* as honest signaling of male quality. — *Behavioral Ecology* 8: 569–579.

Pine, D. S., Grun, J., Zarahn, E., Fyer, A., Koda, V., Li, W., Szeszko, P. R., Ardekani, B. & Bilder, R. M. 2001: Cortical brain regions engaged by masked emotional faces in adolescents and adults: an fMRI study. — *Emotion* 1: 137–147.

Roberts, S. C., Havlicek, J., Flegr, J., Hruskova, M., Little, A. C., Jones, B. C., Perrett, D. I. & Petrie, M. 2004: Female facial attractiveness increases during the fertile phase of the menstrual cycle. — *Proceedings of the Royal Society of London B* 271: 270–272.

Siegel, S. & Castellan, N. J. 1988: *Nonparametric statistics for the behavioral sciences* — McGraw-Hill, New York.

Todorov, A., Mandisodza, A. N., Goren, A. & Hall, C. C. 2005: Inferences of competence from faces predict election outcomes. — *Science* 308: 1623–1626.

Venn, H. R., Watson, S., Gallagher, P. & Young, A. H. 2006: Facial expression perception: an objective outcome measure for treatment studies in mood disorders? — *International Journal of Neuropsychopharmacology* 9: 229–245.