Swiderska, A., Krumhuber, E. G., & Kappas, A. (2013). No matter how real: Out-group faces convey less humanness. In D. Reichardt (Ed.), *Proceedings of the 7th Workshop on Emotion and Computing – Current Research and Future Impact* (pp. 1-8), Koblenz, Germany (September).

No matter how real: Out-group faces convey less humanness

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Abstract. Past research on real human faces has shown that out-group members are commonly perceived as lacking human qualities, which links them to machines or objects. In this study, we aimed to test whether similar out-group effects generalize to artificial faces. Caucasian participants were presented with images of male Caucasian and Indian faces and had to decide whether human traits (naturally and uniquely human) as well as emotions (primary and secondary) could or could not be attributed to them. In line with previous research, we found that naturally human traits and secondary emotions were attributed less often to the out-group (Indian) than to the in-group (Caucasian), and this applied to both real and artificial faces. The findings extend prior research and show that artificial stimuli readily evoke intergroup processes. This has implications for the design of animated characters, suggesting that out-group faces convey less humanness regardless of how life-like their representation is.

Keywords: objectification; realism; face perception; emotion; out-group

1 Introduction

A long-standing question within the field of computer science and artificial intelligence concerns the degree of human likeness required by animated characters, computer agents, and robots. In general, human appearance is viewed as advantageous as it provides a more intuitive and effective interface [1], [2], thereby facilitating various aspects of human-computer interaction. This relates particularly to the face being the most immediate source of communication [3]. Consequently, attempts to increase its humanness have aimed at the development of photorealistic faces that strongly resemble those of living humans [4], [5]. On the other hand, the strive for realism has been countered by arguments about possible experiences of alienation due to the 'uncanny valley' [6]. That is, if computer-generated faces become too close to humans, without making people fully believe that they are real, feelings of discomfort and repulsion may arise [7].

Research exploring perception of artificial facial stimuli, and whether this process is different from that of real faces, has been so far inconclusive. For example, studies involving functional magnetic resonance imaging (fMRI) and event-related brain potentials (ERP) found that artificial faces may be processed distinctly from real faces [8], [9]. Also, the recognition of emotions seems to vary depending on the type of the face [10], [11]. On the contrary, there is evidence suggesting that people do respond to various kinds of artificial faces, as well as to face-like objects, similarly as to real faces [12], [13]. Given that external features and expressions can be easily manipulated and controlled in synthetic faces, they are commonly employed in social categorization studies, the results of which map onto those employing real faces [14], [15].

Independently of controversies linked to the level of realism, faces convey diverse qualities and are processed quickly and possibly preferentially by our brains [16], [17]. They attract attention faster than non-face objects [18] and as a visual cue are favored over other types of input [19]. Furthermore, faces are a social stimulus of major functional significance, prompting rapid evaluations of people on a number of dimensions. These include gender, age, and ethnicity on the most basic level [20], as well as other traits, for instance attractiveness, likeability, and trustworthiness [21]. Importantly, faces are often the first source of information pertaining to group membership. Categorization of people as belonging to one's in-group or out-group is common and in fact unavoidable in real-life social encounters [22]. Numerous studies have shown that in-groups are generally favored over out-groups [23], [24], and that out-group members are frequently the targets of prejudice [25], [26]. One facet of prejudice is the failure to perceive out-group members as complete human beings [27]. In this case, out-groups are not granted the full range of human qualities, including personality traits [28], emotions [29], and mental states [30]. Denial of traits that have been identified as natural or essential to all human beings (naturally human traits, e.g., warmth, depth) reduces people to objects, such as machines or automata [31]. The equation of humans with objects is referred to as objectification [32]. It is associated with the perceived lack of mind and what follows, compromised capacities which are distinctive for humans [33], for example the ability to experience refined emotions (secondary emotions, e.g., elevation, envy) [29].

Although prior studies using real faces have demonstrated that out-group members appear overall less human compared to in-group members [34], [35], [36], this intergroup phenomenon has not been investigated yet in the context of artificial faces. Respective issue seems of importance since the (differential) attribution of human characteristics to group members should apply only to faces of real human beings, that is, entities that actually are alive. Alternatively, if synthetic faces of out-group members are seen as representing diminished humanness, just as real faces are in daily interactions, the most realistic animation may not be adequate for them to be perceived as human-like. Therefore, regardless of how authentic the representation is, out-group faces may still be viewed as machines/ objects.

In the present study, we wanted to explore the process of objectification as it applies to real as well as artificial faces. For this, artificial facial stimuli were used that were

highly human-like, but clearly distinguishable from their real counterparts in terms of aliveness (see [37]). To maximize differences in perception, Caucasian participants were presented with both real and artificial faces of Caucasian (in-group) and Indian (out-group) individuals. Participants' task was to decide whether certain human traits (naturally and uniquely human) and emotions (primary and secondary) could or could not be attributed to each face. As out-groups are generally associated more with objects, we would predict that less human qualities and secondary emotions would be attributed to them. Furthermore, such effects should be similar for real and artificial faces.

2 Experiment

Thirty-one students (11 men), ranging in age from 19 to 27 years (M = 21.84, SD = 2.12), at Warsaw University, Poland, participated on a voluntary basis and were paid 20 PLN (~5€). All of them identified themselves as Polish, with three people holding a double Polish-American citizenship. Information about the experiment was distributed in English and directed primarily at the students of an English-language psychology program to ensure fluency in this language. However, the mother tongue of all participants was Polish.

Facial stimuli (see Fig. 1) consisted of photographs of eight neutral faces of Caucasian and Indian (four of each) adult males, obtained from the Center for Vital Longevity Face Database [38]. These photographs were selected from a larger set of realistic facial stimuli which did not differ in a pretest (N = 30) with regard to their perceived attractiveness (scale 1-5; $M_{Caucasian}$ = 1.97 vs. M_{Indian} = 1.83, p = 0.062), intelligence ($M_{Caucasian}$ = 2.83 vs. M_{Indian} = 2.72, p = 0.348), trustworthiness ($M_{Caucasian}$ = 2.62 vs. M_{Indian} = 2.49, p = 0.152), and likeability ($M_{Caucasian}$ = 2.64 vs. M_{Indian} = 2.71, p = 0.480). The eight photographs served as a basis for creating the faces' artificial analogues by applying a variety of modifications in Photoshop (CS3-ME, Adobe Systems Inc., 2007) while preserving their identity (i.e., no changes in facial morphology). The modified faces (four Caucasian, four Indian) composed the set of artificial versions of the stimuli and differed significantly in perceived aliveness, as determined in an independent study (N = 60, M_{real} = 6.15 vs. $M_{artificial}$ = 1.52, p < 0.001, scale 1-7). Additionally, eight images of cars were included as filler items with the purpose to distract from the target manipulation. This resulted in a set of 24 pictures which measured 627 x 479 pixels and were displayed on a white background.

Participants took part in the study individually. Their task was to decide "whether a certain characteristic could or could not be ascribed to a stimulus". This decision had to be made as quickly as possible for every stimulus and characteristic which added up to 384 trials (24 images x 16 characteristics, described below), presented randomly in four blocks. To signal the beginning of each trial, a fixation cross appeared on the top of the screen for 500 ms; it was then replaced by a word (label of a trait), which was displayed for 1000 ms; finally, underneath the word, a picture of the stimulus appeared. The word and the picture remained on the screen until participants gave a

response by pressing a key on the keyboard, corresponding to either a '*yes*' (the characteristic can be attributed to the stimulus) or a '*no*' (the characteristic cannot be attributed to the stimulus) judgment. The experimental task was delivered using DirectRT software (Version 2010, Empirisoft Co., NYC, USA).

Fig. 1. Examples of real (left) and artificial (right) Caucasian and Indian faces.

Measures targeted the frequency with which a given characteristic (human traits and emotions) was ascribed to a stimulus. Human traits were selected based on dehumanization research by Haslam and colleagues [31], [39], and comprised four uniquely human traits (positive: *organized, broadminded*; negative: *rude, shallow*) and four naturally human traits (positive: *friendly, trusting*; negative: *shy, impatient*). Emotion terms were drawn from research by Demoulin et al. [40], and comprised four primary emotions (positive: *pleased, calm*; negative: *fearful, angry*) and four secondary emotions (positive: *sympathetic, hopeful*; negative: *ashamed, guilty*). As both positive and negative characteristics were included, valence was treated as an additional factor in the analysis of results.

3 Results

A multivariate analysis of variance (MANOVA) with Ethnicity (Caucasian, Indian), Realism (real, artificial), and Valence of the traits (positive, negative) as within-subjects factors was conducted on the four dependent variables (uniquely and naturally human traits, primary and secondary emotions). For all univariate analyses, the Greenhouse-Geisser adjustment to degrees of freedom was applied. No significant main effect emerged for Realism $F(4, 27) = 1.57$, $p = 0.212$, $\eta_p^2 = 0.19$, suggesting similar responses to real and artificial faces. The multivariate main effects were significant for Ethnicity, $F(4, 27) = 5.32$, $p = 0.003$, $\eta_p^2 = 0.44$, and Valence, $F(4, 27)$

= 8.07, $p < 0.001$, $\eta_p^2 = 0.55$. These two main effects were qualified by a significant multivariate interaction between Ethnicity and Valence, $F(4, 27) = 4.07$, $p = 0.01$, $\eta_p^2 = 0.38$. In terms of univariate tests, this interaction was significant for the naturally human traits, $F(1, 30) = 8.99$, $p = 0.005$, $\eta_p^2 = 0.23$, as well as for secondary emotions, $F(1, 30) = 4.44$, $p = 0.044$, $\eta_p^2 = 0.13$. Analyses of simple effects showed that participants attributed more naturally human traits and secondary emotions to Caucasians ($M = 0.56$ and $M = 0.52$) in comparison to Indians ($M = 0.40$ and $M = 0.42$). However, this was the case only in the context of positive characteristics. No such differences occurred for negative naturally human traits and negative secondary emotions ($p > 0.05$). The proportions of characteristics attributed to Caucasian and Indian faces can be seen in Fig 2.

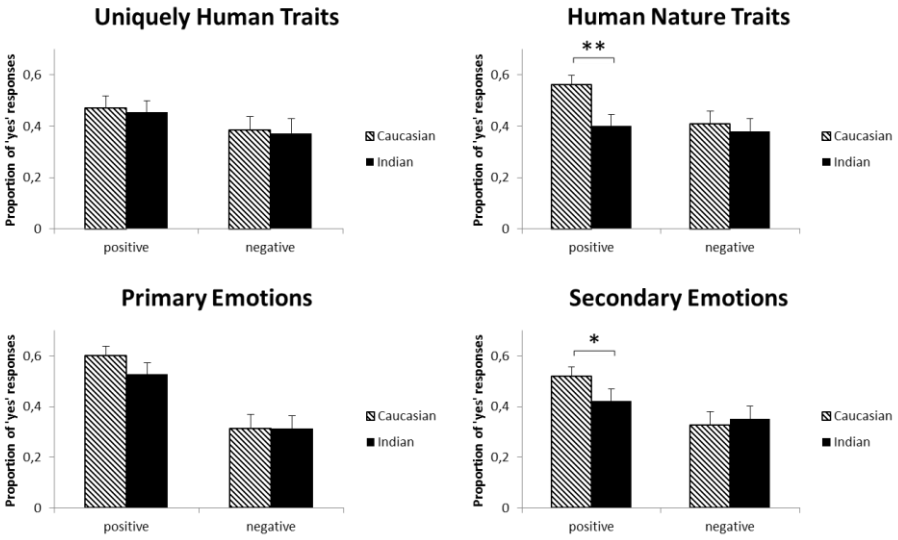

Fig. 2. Mean proportions of human traits and emotions attributed to Caucasian and Indian faces; $^{**}p < 0.01$, $^{*}p < 0.05$.

4 Discussion

Out-group members are commonly denied an array of human qualities which reduces them to objects, such as machines or automata. These specifically include traits perceived as naturally human [31] and refined emotions that entail high cognition and morality (secondary emotions), but not emotions shared with other species (primary emotions) [29]. In the current study, our objective was to extend previous findings that demonstrated the process of objectification for real faces and to investigate whether this generalizes to artificial faces. In line with previous research, the results showed that participants attributed less naturally human traits to faces of out-group members in comparison to in-group members. Moreover, they attributed less secondary emotions to faces of out-group members than to in-group members, while there were no differences in how primary emotions and uniquely human traits were

attributed. The findings applied to both real and artificial stimuli, suggesting that the latter readily evoke intergroup processes, bringing about out-group effects comparable in their nature to real faces.

Although the pattern of differential attribution of human traits and emotions to in-group and out-group members was consistent with predictions implying objectification [31], it concerned largely positive characteristics. Besides similar findings in the literature [35], there is evidence suggesting that the valence of human characteristics may not play a crucial role in how these are associated with groups [41]. In fact, sometimes negative naturally human traits tend to be connected even more with the in-group, justifying the "only human", inborn and therefore uncontrollable nature of their flaws [42]. Differential attribution of positive characteristics can thus be seen as one facet of objectification, thereby indicating a positivity bias towards the in-group.

The findings have important implications for the design and animation of computer-generated characters. Up to now, the developments in computer graphics have focused on increasing the realism of synthetic characters to the point that they are indistinguishable from living humans. In this context, major efforts have been devoted to the generation of photorealistic faces. To circumvent deficiencies in appearance that lead to unsettling impressions on the part of viewers, ascribed to the 'uncanny valley' [6] research in turn has scrutinized the potentially problematic elements of faces. This was typically done as if the faces were a collection of separate features, colors, and textures [7], [37] rather than a whole that functions as a social stimulus in interaction with the human perceiver.

In the current paper, we have shown that group membership plays a major role in how human-like a face appears to be. One possible extension of this research would be to conduct it in a different country. For instance, would Indian participants attribute greater humanness to Indian (in-group) faces and perceive Caucasian (out-group) faces as objects? Further, how would categories other than race or ethnicity influence perception of human qualities in another? People go beyond what is directly observable and constantly make inferences about the underlying states, intentions, and qualities of other interactants. A crucial function of faces is that they represent human qualities and are associated with minds that powerfully suggest a potential for mental connection, constantly sought after by humans [43]. Nonetheless, people will not connect with everybody in the same manner. Group membership proved to be a basic criterion that determines to what extent such mental connection is achieved. Independently of whether the face is real or artificial, we demonstrated that out-group members were generally viewed as more machine/ object-like than in-group members, hence embodying lesser humanness and what follows, reduced promise of bonding. Accentuated realism of computer-generated faces alone may consequently not be sufficient to capture the complexities and subtleties of human perception. Rather, the design of human-like agents necessitates consideration of purpose-related, social psychological processes.

Acknowledgments. This work has been conducted within the European Commission project eCUTE – Education in Cultural Understanding, Technologically-Enhanced (FP7-ICT-2009.4.2).

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