First impressions of strangers rely on generalization of behavioral traits associated with previously seen facial features

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Abstract

Information drawn from faces at the very first encounter can be essential in guiding current and subsequent behavior. These decisions also rely on expectations about what are the characteristic features of those who can be trusted or not. After novel experiences these expectations will be revised, and the facial prototypes stored in the memory will be updated. The aim of the recent experiment was to test whether behavioral information about individuals will be transferred to composite facial images. We created composite faces of individual images which were previously presented with either positive or negative behavioral descriptions. We found that the composite made from faces shown with traits referring to high social desirability, was rated as significantly more trustworthy. We propose that exposure to faces and acquisition of socially relevant information shape facial prototypes, ensuring that the evaluation of unknown individuals reflects expectations based on real-life experiences. We further propose that this process is mediated by the generalization of behavior information and facial features, rather than the detection of visual similarity.

Keywords: stereotypes; prototypes; similarity; face perception.

Introduction

Information drawn from faces at the very first encounter can be essential in guiding current and subsequent behavior (Quinn & Macrae, 2011; Zebrowitz, 2004; Zebrowitz & Montepare, 2008). It has also been demonstrated that assigning faces to social categories precedes face identification itself (Quinn, Mason, & Macrae, 2009, 2010). Whereas the analysis of a multitude of facial features and the extraction of configural or holistic information are necessary to identify a face correctly (e.g., Leder & Bruce, 2000; Maurer, Le Grand, & Mondloch, 2002; Rhodes, Brake, & Atkinson, 1993, cited in Quinn & Rosenthal, 2012), even a single feature can support appropriate categorization (Cloutier & Macrae, 2007; Cloutier, Mason, & Macrae, 2005). The categories themselves, however, are not static, but change dynamically during social interactions, as it was proposed by the contact hypothesis (e.g., Allport, 1954; Cook, 1985; Gaertner, Dovidio, & Bachman, 1996; Pettigrew, 1998, but for limitations of this theory see Rothbart, 1996). After novel experiences with members of a social category the expectations will be revised, and the typical physical characteristics of the categories will be updated.

The importance of this continuous updating comes from the fact that categorizing faces as belonging to a particular group has an essential effect on the evaluation of these people. The mere knowledge of someone being part of one or other social group is likely to activate stereotypes and an impression about that individual (e.g., Biernat, Manis, & Nelson, 1991; Bodenhausen & Wyer Jr., 1985; Duncan, 1976; Kunda & Sherman-Williams, 1993; Sagar & Schofield, 1980; Secord, Bevan, & Katz, 1956; Vallone, Ross, & Lepper, 1985). This also influences the behavior towards that person (Wheeler & Petty, 2001). In the social psychology literature the term *stereotype* refers mostly to prejudices against members of more or less distinct groups differentiated by sex, age, ethnicity, occupation, or profession (Hilton & von Hippel, 1996; McGarty, Yzerbyt, & Spears, 2002). Speaking about stereotypes in a broader sense, it also refers to personal preconceptions in the way someone evaluates strangers based on multiple features, such as their appearance. In this sense, the first impression of whether an unknown individual can be trusted or not, is based on stereotypes.

Stereotypical decision-making seems to be essential in how we perceive others. Preconceptions about members of a social category can be quite persistent, as several maintenance mechanisms contribute to their resistance to change (see Hilton & von Hippel, 1996; Roese & Sherman, 2007; Todd, Galinsky, & Bodenhausen, 2012). However, social cognition would not be effective and would lead to too many false inferences, unless impression formation relied heavily on more relevant initial information, such as observed behavior (Gilbert & Malone, 1995; Todorov & Uleman, 2002, 2004; Trope & Alfieri, 1997) or socially relevant information (e.g., Heilman, 1984; Locksley, Borgida, Brekke, & Hepburn, 1980; Nisbett, Zukier, & Lemley, 1981). The overall evaluation of a particular person will emerge as an interplay between stereotypical judgments and trait inferences made after direct observations. At first impression, though the former may be less accurate, it might be much more easily be utilized by the cognitive apparatus responsible for social decision-making (see Bar, Neta, & Linz, 2006; Engell, Haxby, & Todorov, 2007; Todorov, Pakrashi, & Oosterhof, 2009; Willis & Todorov, 2006).

Experience with others, as stated earlier, will affect to some extent what is expected from the particular social category to which they belong (see Rothbart, 1996). This holds not only in what behavior is expected from individuals when they are categorized as members of a well-known group, but the other way round, too: people have ideas about the physical traits which the members of this group are likely to have. To put it differently, direct social interactions will shape *stereotypes* (i.e., how we think members of a group or people with certain facial features will behave), and *prototypes* (i.e., how we think people showing certain behavioral traits will look). In an experiment exploring visual representations of social dimensions, Imhoff et al. (2013) showed that trustworthiness and competence evoke different facial representations. Similarly, Dotsch, Wigboldus and van Knippenberg (2013) visualized prototypes of a trustworthy and a criminal group. Ratner et al. (2014) showed that facial representation of an outgroup member facilitates less favorable impression than the prototype face of an ingroup member. The traits attributed to ingroup prototypes include attractiveness, intelligence, trustworthiness, sociality, and so on. These findings highlight the strong connection between stereotypes and prototypes. Besides, social categorization seem to work on multiple levels: categorizing someone into a social group or assigning someone socially relevant personality traits might well recruit the same cognitive processes.

If we narrow our view of stereotypes as a concept referring to a set of trait information inferred from physical appearance – and, somewhat liberally, set aside the fact that abstract labels can activate stereotypes as well (Kawakami, Dion, & Dovidio, 1998; Kawakami, Dovidio, & Dijksterhuis, 2003; Kawakami & Dovidio, 2001) – stereotyping and formation of facial prototypes can be seen as two outputs of the same complex cognitive mechanisms involved in person perception. An enormous body of studies exists scrutinizing the formation of stereotypes and the conditions under which they can be changed (e.g., Heilman, 1984; Locksley et al., 1980; Nisbett et al., 1981; Wyer, 2013). One possible route of how stereotypes are formed is *generalization* (Hilton & von Hippel, 1996). It is a cognitive mechanism which seems to be universal across the animal kingdom and is likely to originate from the general properties of the nervous system. Its functional aspect is to help find optimal solutions to the challenges of the outside world more quickly by taking advantage of the fact that similar stimuli often share causal relations with events (Ghirlanda & Enquist, 2003). Generalization is particularly useful when the availability of information is limited. In the case of stereotyping, one individual's behavior is generalized to others with whom they share, for instance, group membership or physical features.

The same process can be described from the viewpoint of facial prototypes (Valentine & Endo, 1992). Physical features, just like group membership, might be considered as predictive of social behavior. The expectation that people with certain facial characteristics will behave in a consistent manner usually develops due to generalization of an observed association between behavior and appearance. A couple of studies have already examined this process. These suggest that formerly unseen faces can easily be associated with social judgments (Bliss-Moreau, Barrett, & Wright, 2008), which then influence the evaluation of faces similar to these (Gawronski & Quinn, 2013; Verosky & Todorov, 2010, 2013). In their study Verosky and Todorov (2010) presented individual faces and behavioral descriptions together. Novel faces were morphed in various proportions (20% and 35%) so that they resemble those presented before. The trustworthiness ratings of the manipulated faces approximated to that of the learned faces proportionately with the level of physical resemblance. The authors proposed that the learning of associations between facial features and behavioral traits and the recognition of physical similarity could be the vehicle for transfer of affective valence from known to novel faces. The same assumption has been framed into the more specific concept of transference, focusing on the importance of affection towards significant others (Andersen & Baum, 1994; Andersen & Chen, 2002; Berk & Andersen, 2000; Günaydin, Zayas, Selcuk, & Hazan, 2012; Kraus & Chen, 2010).

In contrast to the studies highlighting the role of mere physical resemblance in impression formation, attempts have been also made to take a more general approach. Jones and his colleagues (Jones, Debruine, Little, & Feinberg, 2007) investigated whether facial prototypes rather than attitudes to certain facial characteristics can be changed with non-social stimuli. They were able to demonstrate that the evaluation of composite faces can be influenced by presenting aversive or neutral sounds along with the individual images of which the composites were made. Hence, it seems that associative learning and generalization might contribute to the formation of facial prototypes, influencing the appeal of individual faces.

However, it is not clear whether the generalization of the affective valence of a person and the ability to make inferences from behavior traits using detection of physical similarity build on the same processes. The aim of the recent experiment was to test whether behavioral information about individuals will be transferred to composite facial images, as would be expected if generalization played a role in this kind of social decision-making. To this end, individual faces were presented with either positive or negative behavioral descriptions. Then, the positive and negative image sets were used to create two composite faces. We hypothesized that the former will be rated as more trustworthy.

Methods

Participants

Of the 116 subjects (age: M = 26.302, SD = 10.125, 19–69 years) 48 were males (age: M = 25.667, SD = 7.78, 19–52 years) and 68 females (age: M = 26.750, SD = 11.532, 19–69 years). The data were collected in two turns by two independent experimenters (64 and 54 subjects, respectively). The procedures were identical except the evaluation phase (see the *Procedure* section).

Stimuli

Ten male faces with average attractiveness were used from an image pool collected in a previous experiment. The positive correlation between attractiveness and positive social characteristics (e.g., Griffin & Langlois, 2006), including trustworthiness (e.g., Dewolf, 2014), has been demonstrated by former studies, therefore we assumed these faces would be fairly similar regarding trustworthiness. The face set was randomly divided into two subsets. From the five images of the two subsets composite faces were made (*Fig. 1*) using *Psychomorph* (Tiddeman, Burt, & Perrett, 2001; Tiddeman, Stirrat, & Perrett, 2005).

Twenty-five volunteers (age: M = 20.56, SD = 1.47, 19–25 years, 15 females and 10 males) were shown 52 sentences describing social behaviors related to rule following, violent tendencies, relations with family members, friends, and colleagues and were asked to imagine that they knew nothing about an individual but the given information, and indicate their impression on a 1 to 9 Likert-scale. Ten of the most negative (ratings: M = 1.94, SD = 0.55) and ten of the most positive (ratings: M = 7.34, SD = 0.65) sentences were selected from this pool, and were arranged into ten pairs (*Appendix*).

Procedure

The experiment consisted of three phases. In the *learning phase*, individual faces were presented on a screen, each associated either with a negative or a positive pair of sentences. The participants were instructed to watch the faces carefully and try to memorize the descriptions. To ensure that eventual difference in the *a priori* trustworthiness of the stimuli faces would not influence the results, approximately half of the subjects (n = 59) saw the negative descriptions assigned to the first image set, while the others saw the same images with positive behavioral descriptions. The image order was randomized with *Dmdx* presentation software (University of Arizona). The participants could move to the next image by pressing a button on a keyboard. If they did not respond in 60 seconds, the image was automatically replaced with the next stimulus.

This was followed by the *recollection phase*, when the previous faces were presented again in a randomized order, without any description. The subjects had to indicate whether they found the presented individual trustworthy or not. They were not explicitly instructed to rely on the previous descriptions, but if their answer was different from what the descriptions implied, they were returned to the first phase, until the learning was entirely successful.

In *evaluative phase* the participants had to decide which of the two composite faces – made from the faces associated either with negative or positive descriptions – they found more trustworthy. In order to obtain data for an improved statistical analysis, for the subjects participating in the second turn of data collection (n = 54) the stimuli material was presented a second time again, and the participants had to rate them for trustworthiness on a 1 to 9 Likert-scale. After the evaluative phase the participants were debriefed. None of them reported that either they knew someone personally from the presented individual faces or looked familiar.

Results

The participants learning performance showed marked differences. Twenty subjects were able to categorize the faces according to the formerly presented descriptions after a single presentation, while one subject needed nine learning-recollection cycles until all the faces were categorized correctly ($M = 2.98$, $SD = 1.52$).

The subjects' success in formation of new prototypes was indicated by their choice between the two composite faces. The results of the one-sample Chi-square test showed that the subjects found the composite which was made of the faces with positive descriptions more trustworthy ($\chi^2 = 9.966$, $df = 1$, $p = 0.002$, $n = 116$, *Fig. 2*). There was no significant difference between men and women (two-sample chi-square test: $\chi^2 = 0.166$, $df = 1$, $p = 0.683$). The random assignment of the two image subsets to negative or positive descriptions did not influence the success rate (two-sample chi-square test: $\chi^2 = 0.220$, $df = 1$, $p = 0.639$), indicating that the individual faces in the two sets were on average of equal trustworthiness indeed.

The analysis of the scores given to the two composites led to similar results. The paired-samples t-test showed that the positive composite was rated as significantly more trustworthy than the negative one, with a medium level effect size ($t = 2.401$, $df = 53$, $p = 0.02$, Cohen's $d = 0.5$, $n = 54$, *Fig. 3*). Besides, the positive composite scored significantly higher than the scale mid-point ($M = 5.685$, $SD = 1.646$, one-sample t-test: $t = 3.058$, $df = 53$, $p = 0.003$), while the ratings of the negative composite did not differ from the middle point of the rating scale ($M = 4.929$, $SD = 1.536$, one-sample t-test: $t = -0.348$, $df = 53$, $p = 0.729$).

Discussion

The current experiment aimed at finding support for the assumption that formation of facial prototypes, as an effective basis of comparison when inferences about unknown people are made, happens due to the ability of the nervous system to generalize previous experiences. We found that when individual facial images are associated with sentences describing behavioral traits and composites are made from those with low and high social desirability, respectively, the high valence composite is rated significantly more trustworthy.

These results seem to support the hypothesis, though admittedly other explanations are possible as well. People are able to include experience with others in their social decisions in a relatively short time (Bliss-Moreau et al., 2008; Hill et al., 1990; Lewicki, 1985). These impressions are then summed and stored in the memory and are projected onto unknown individuals who have facial features similar to the ones formerly seen (Zebrowitz, Bronstad, & Lee, 2007; Zebrowitz, Fellous, Mignault, & Andreoletti, 2003; Zebrowitz, White, & Wieneke, 2008). However, we are yet to answer whether there is any difference, on the cognitive level, between transference of attributes – based on perceptual resemblance (Andersen & Baum, 1994; Andersen & Chen, 2002; Berk & Andersen, 2000; Günaydin et al., 2012; Kraus & Chen, 2010) – and generalization of behavioral traits resulting in facial prototypes.

The composite faces used in the evaluative phase of this study are equally similar to each of the five faces from which they were made. The average valence of the sentences used in the learning phase were the same within a set, but we did not measure the participants' subjective feelings about how these descriptions influenced their impressions of the faces. Similarly, though the average attractiveness of the faces was equal, idiosyncratic differences in face preferences might have skewed the appeal to these already at the first exposure. Consequently, we cannot rule out the possibility that the relative contribution of the five faces to the trustworthiness ratings of the composites was not equal at the individual level. This also implies that a composite's resemblance to *either* of the five faces could mediate the trait inference, and no prototype formation was necessary. This limitation prevents us from drawing hard conclusions about the nature of the underlying process, and highlights the necessity of studies aiming at a more direct comparison of the two approaches.

We would also like to note that the results might have been different if we used faces with features most people strongly associate with trustworthiness or untrustworthiness. People tend to rely selectively on stereotype congruent information (Hilton & von Hippel, 1996). Therefore, if we presented positive descriptions with faces judged as untrustworthy, a strong incongruence might deter subjects from building associations between facial features and behaviors (Tausch & Hewstone, 2010), while an apparent, but moderate inconsistency might still influence the ratings of the composite faces. However, the observation that incongruent trait information is better remembered than congruent information (e.g., Heider et al., 2007; Sherman & Hamilton, 1994) stays in contrast with this assumption. For that reason this question definitely needs to be addressed in future research. In addition, in the present study we used only male faces to avoid interference between the formation of different prototypes (male/female, trustworthy/untrustworthy). Attention towards male and female faces, however, could differ, depending on sexual interest. In a future study using female faces we could test the effect of this attentional bias on prototype formation.

To sum up, the main difference between former experiments using morphing techniques (Gawronski & Quinn, 2013; Verosky & Todorov, 2010, 2013) and our study is that in the latter the assumption about how trait inferences are made is extended beyond similarity detection, to prototype formation. This distinction might be crucial if we are about to understand the processes behind stereotypical social evaluations. It seems that generalization, which is a universal ability of the nervous system, is advantageous in the social domain as well. We propose that exposure to faces and acquisition of socially relevant information shape facial prototypes, which, in turn, influence how novel faces will be categorized. This ensures that the evaluation of others, however stereotypical, reflect expectations based on real-life experiences.

Compliance with Ethical Standards

All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards. Informed consent was obtained from all individual participants included in the study.

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Figures

Fig. 1

Composite faces, each made of five individual facial images. Note that the two sets of faces were randomly assigned to positive and negative behaviors, thus the eventual difference in the *a priori* trustworthiness of the composites did not influence the results.

Fig. 2

Results of the forced choice test (n =116). The composite made of faces described as showing positive behaviors was chosen significantly more (n = 75) than the composite made of faces with descriptions referring to untrustworthiness (n = 41).

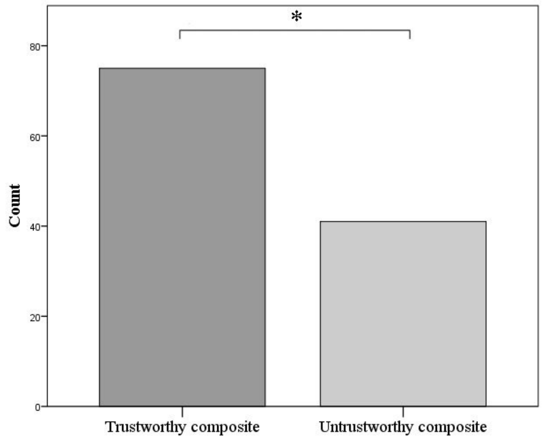
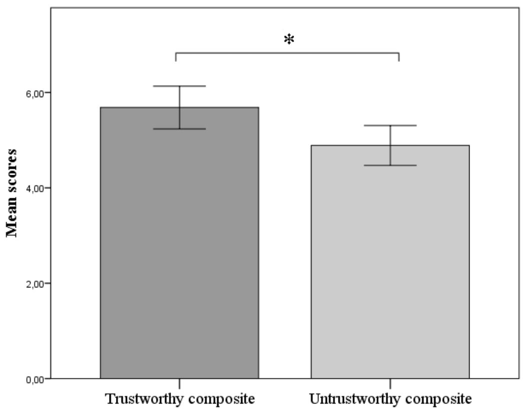


Fig. 3

Results of the numerical face evaluation (n = 54). The composite made of faces described as showing positive behaviors was given significantly higher scores (M = 5.685) than the composite made of faces with descriptions referring to untrustworthiness (M = 4.889). Error bars show the standard error.



Appendix

Sentence pairs describing positive behavior

1: He sticks by co-workers, even when they make mistakes.

Events together with his family members have priority.

2: He is always there for his colleagues in case they need help.

He is polite and cooperative.

3: His friends like him because of his even temper and humor.

He is pleased by the success of his co-workers.

4: He is always sincere and friendly with new colleagues.

He is trustworthy; his friends can always rely on him.

5: He is glad when his colleagues are successful.

He spends plenty of time with his children, reads them stories frequently.

Sentence pairs describing negative behavior

6: He always gets angry when he cannot get what he wants.

He was spotted several times kicking his dog.

7: He scorns colleagues when they make mistakes.

He ran into debt because of compulsive gambling.

8: He physically abused his children.

He caused car accidents several times when he was intoxicated.

9: He ran his family into debt because of his addiction to gambling.

He interfered with the law couple of times.

10: He takes advantage of the reliance of his family and friends.

He caused an accident under the influence of drugs.