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First Impressions: Do Faces with Scars and Palsies Influence Warmth, Competence, and Humanization?

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Abstract

A glance is enough for people to assign psychological attributes to another person. Attractiveness is associated with positive attributes contributing to the "beauty-is-good" stereotype. Here, we aimed to study the possibility of a similar but negative bias. Specifically, we asked if people with facial anomalies are associated with negative characteristics, and if so, what accounts for this association. We tested the hypothesis that biases against faces with scars and palsies arise because of negative stereotypes (less warmth and competence) and forms of dehumanization (animalistic and mechanistic). Using well-controlled stimuli (i.e., photographs of real people before and after plastic surgery) and a wide range of faces to avoid race, age, and gender biases in facial perception, we found that anomalous faces were seen as less warm, competent, and were dehumanized (in both animalistic and mechanistic ways). Our study supports the "anomalous-is-bad" stereotype, and further exposes reasons for why faces with anomalies elicit more negative evaluations compared to the same faces before the surgery.

Keywords: face perception; warmth; competence; dehumanization; scar; palsy

First impressions from faces have real-world consequences (Olivola et al., 2014). They may bear on financial success (Duarte et al., 2012; Rule & Ambady, 2011) and judicial decisions (Jaeger et al., 2020; Wilson & Rule, 2015). A well-established "beauty-is-good" phenomenon occurs, wherein positive characteristics are attributed based on physical beauty. Attractive people compared to less attractive people are seen as possessing more socially desirable personality traits and leading better lives (Dion et al., 1972), being "purer" (Klebl et al., 2021), more trustworthy (Villavisanis et al., 2022), and having a "more beautiful" heart (Cui et al., 2019). More positive impressions of attractive people are related to the "halo effect" (Eagly et al., 1991), a tendency to assess others positively in many areas based on at least one positive judgment about them. As a complement to the "beauty-is-good" stereotype, an "anomalous-is-bad" stereotype posits that people with visible facial differences are seen not only as less attractive but also as less moral (Jamrozik et al., 2019; Workman et al., 2022).

Millions of people have visible differences, like scars and palsies. In contrast to the ubiquity of scars, which Hollywood has used for decades as visual shorthand signifying moral corruption (Croley et al., 2017), permanent palsies are less common (Fuller & Morgan, 2016). Visible differences may engender different manifestations of the anomalous-is-bad stereotype. For example, American participants judged individuals with facial differences as having less desirable personality traits (e.g., emotional stability), internal (e.g., intelligence), and social attributes (e.g., trustworthiness) (Jamrozik et al., 2019). Despite observing these results, we still have much to learn about the nature of the anomalous-is-bad stereotype, especially regarding the perception of other traits and attributes. Here, we examined how different facial anomalies (i.e., scars and palsies) are perceived along social dimensions of warmth and competence (Fiske et al., 2007b)

and whether they elicit attitudes in perceivers that are consistent with different forms of dehumanization (Kuljian & Hohman, 2022).

Face-Reading of Warmth, Competence, and its Impact on Dehumanization

Social perceptions may be organized along the dimensions of warmth and competence (Abele & Wojciszke, 2013). These dimensions are sometimes referred to with different names despite describing similar concepts. Warmth is sometimes called communion (Abele & Wojciszke, 2007) or morality (Phalet & Poppe, 1997). Competence (Fiske, 1998, 2018; Fiske et al., 2002, 2007a) is sometimes called agency (Abele & Wojciszke, 2013) or ability (Brycz & Wojciszke, 1992). Warmth signals a person's relation to others, e.g., if someone is friendly or empathetic (Abele & Brack, 2013; Brambilla et al., 2011, 2021). Competence signals one's ability to accomplish goals and is related to skills like intelligence and efficiency (Abele & Brack, 2013; Brambilla et al., 2011, 2021).

Individuals regard more attractive people as warmer and more competent (Dion et al., 1972; Eagly et al., 1991). Visible differences lower perceptions of warmth (Jamrozik et al., 2019; Workman et al., 2021, 2022; Zebrowitz et al., 2003). However, evidence for a negative effect of visible differences on competence is mixed. Anomalous faces can elicit impressions of lower competence than attractive faces (Zebrowitz et al., 2003). Yet, members of the Hadza hunter-gatherer tribe of Northern Tanzania who interacted with outside cultural groups thought facial scars signified *more* competence (Workman et al., 2022). Understanding how warmth and competence are read from faces is not only important for understanding how social impressions are formed but can offer insight into discriminatory attitudes people harbor towards individuals with facial differences. For example, lower warmth and competence may trigger forms of dehumanization (Kuljian & Hohman, 2022). Dehumanization refers to perceiving a person or

group as lacking "humanness" (Harris & Fiske, 2011; Haslam et al., 2012; Smith, 2014). Denying someone "humanness" means denying their capacity for rich inner lives (e.g., emotional and/or cognitive) that characterizes what it means to be human (Rai et al., 2017).

At least two types of dehumanization can occur: animalistic and mechanistic (Haslam, 2006; Haslam & Murphy, 2020). The first entails likening people to animals (i.e., animalistic dehumanization) and denies them human capacities such as morality, maturity, refinement, civility, rationality, and logic. The second entails likening people to inanimate objects (i.e., mechanistic dehumanization) and denies them capacities for emotional experiences, interpersonal warmth, cognitive openness, agency, individuality, and depth. The stereotyping based on warmth and competence and forms of dehumanization are not mutually exclusive. Kuljian and Hohman (2022) found that both types of dehumanization appeared when subjects were evaluated as having lower warmth and competence. The available evidence suggests—consistent with the "anomalous-is-bad" stereotype—that faces with visible differences are subjected to animalistic dehumanization (Workman et al., 2021). However, whether such faces also trigger mechanistic dehumanization has not been studied. We suspect that people with facial anomalies may also be dehumanized in this way because individuals tend to dehumanize mechanistically specific groups with less power or who suffer more, such as the mentally ill (Boysen et al., 2020; Martinez et al., 2011), or medical patients (Lammers & Stapel, 2011; Vaes & Muratore, 2013), and people with facial anomalies may be treated also as such target group. Moreover, we need more studies focused on specific facial anomalies to determine if the anomalous-is-bad bias is especially sensitive to some kinds of anomalies more than others. Some but not all anomalies might elicit negative, dehumanizing attitudes towards the people who harbor those facial anomalies.

The Current Research

Based on the previous findings about the perception of people with facial anomalies (e.g., Hartung et al., 2019; Jamrozik et al., 2019; Workman et al., 2021), we predicted that faces with facial anomalies would be seen as less warm, competent, and would be more dehumanized than those same faces after surgical intervention. The present study builds on previous work in several key ways:

(1) We studied two kinds of anomalies (i.e., scars and palsies) to measure whether they elicit differences in face perception. In previous studies, participants rated faces with heterogeneous visible differences (e.g., Jamrozik et al., 2019; Workman et al., 2021), making it impossible to specify findings to any one kind of anomaly. We hypothesize that the consequences of visible differences for first impressions may depend on the specific anomaly a given face harbors;

(2) We probed for two types of dehumanization (i.e., animalistic and mechanistic). Previous work, based on patterns of neural activity, provided indirect evidence that anomalous faces trigger animalistic dehumanization (Workman et al., 2021). However, it remains to be seen whether visible differences also trigger mechanistic dehumanization. On this account, people with facial anomalies are seen as things, a potentially important source of negative biases (Lammers & Stapel, 2011; Vaes & Muratore, 2013);

(3) We used tightly controlled stimuli (i.e., photographs of real people before and after plastic surgery) (Workman & Chatterjee, 2021), contrary to past research that used synthetic faces generated by a computer. Using photographs instead of generated faces has advantages (see also: Cook & Over, 2021). Additionally, we used a diverse set of faces regarding race, age, and gender to avoid possible bias based on demographic features. For example, women can be seen as warmer but less competent and less human than men (reviewed by Haslam & Loughnan, 2014).

This way, we avoid the limitations of past studies regarding the stimuli's racial diversity; past studies typically used mainly White faces (Chatterjee & Workman, 2021; Cook & Over, 2021; Workman & Chatterjee, 2021);

(4) We also measured the assessment of the perceived attractiveness and age of evaluated persons. We know that attractiveness is a powerful signal used to form first impressions about others (e.g., Cui et al., 2019; He et al., 2022). Age also seems to be a powerful signal such that youth is seen in a more positive light than aging (Erber & Long, 2006; He et al., 2021; Miller et al., 2009). These findings are consistent with ageism and age-related stereotypes (North & Fiske, 2012, 2015). For instance, older people in many countries (Durante et al., 2017) are viewed as less competent but warmer than younger people (Fiske et al., 2007b; Wojciszke, 2005).

Preregistered Hypotheses

Hypothesis 1

Anomalous faces are subject to an "anomalous-is-bad" stereotype. Anomalous faces will be rated more negatively in terms of warmth and competence and will be more dehumanized (in animalistic and mechanistic ways) compared to the same faces after corrective surgery (P1.1.). Alternatively, anomalous faces may elicit worse ratings of warmth than faces that have undergone corrective surgery with no differences in competence (P1.2A.). Furthermore, anomalous faces may elicit animalistic dehumanization compared to faces that have undergone corrective surgery but not mechanistic dehumanization (P1.2B.).

Hypothesis 2

The negative appraisals of faces with visible differences compared to faces without such differences occur regardless of the specific type of anomaly. Dehumanization (animalistic and mechanistic) and ratings of warmth and competence will not differ significantly between faces

with palsies compared to faces with scars (P2.1.). Alternatively, dehumanization (animalistic and mechanistic) and ratings of warmth and competence may differ between faces with palsies relative to faces with scars, although the expected direction of such an effect is unclear (P2.2.). One could imagine that scars signal lower warmth and higher competence (as often depicted in movie villains), in a way that palsies might signal lower competence if thought to be a signal for compromised health.

Method

This preregistered study (https://osf.io/m56wb/?view_only=6f843e18a74a48bcbfa071830ec4a428) was reviewed and approved by the Institutional Review Board at the University [blinded]. The materials, data, and analysis codes are available at: https://osf.io/kf654/?view_only=f99d62d48ceb4bf68379a7bf44d4dc6b.

Participants & Procedure

We aimed to recruit approximately $N = 1500$ participants. Using effect sizes calculated from the data reported by Jamrozik and colleagues (2019), a minimum of 102 responses per dimension was expected to provide sufficient power (80%) to detect differences in warmth and competence judgments when comparing anomalous faces before and after surgical correction. Acquiring 102 responses per dimension also ensured sufficient reliability (Cronbach's $\alpha > 0.8$). We targeted over 120 responses per face rating dimension to provide a buffer against exclusions of low-quality data.

Healthy adult volunteers aged 18 and older from the United States were recruited through Amazon's Mechanical Turk service to complete an online survey (Buhrmester et al., 2018). Participants could not have significant visual impairments that would disrupt their ability to complete the study. The survey took approximately 30 minutes, and participants were

compensated $4 for their time. We used attention checks to detect whether participants were engaged throughout the survey (see materials at OSF: https://osf.io/kf654/?view_only=f99d62d48ceb4bf68379a7bf44d4dc6b). Following our preregistered criteria, we excluded participants who failed more than 2 of 3 attention checks. Additionally, we asked participants whether they believed their data was high-quality enough to be included in the study (Curran, 2016). Their data were not used if they answered negatively on this question.

A total of $N = 1493$ individuals took part in our study. After implementing our preregistered exclusion criteria, the sample size was $N = 1306$ ($n = 446$ women; $n = 854$ men; $n = 1$ other; $n = 1$ nonbinary; $n = 4$ did not wish to say) with a mean age of $M = 36.51$ ($SD = 10.23$ years; range: 20 – 84) and a mean education of $M = 14.82$ ($SD = 2.97$ years; range: 1 – 26). Regarding race and ethnicity, $n = 1086$ participants were white, $n = 100$ African-American, $n = 51$ Asian, $n = 27$ American-Indian, $n = 1$ was Pacific-Islander, $n = 25$ were multiracial, $n = 6$ chose the option "other," $n = 10$ did not wish to say. We also asked if participants identified as Hispanic or Latino; $n = 275$ answered positively, $n = 1019$ negatively, and $n = 12$ did not wish to say. Regarding sexual orientation, $n = 957$ participants identified as heterosexual, $n = 38$ homosexual, $n = 285$ bisexual, $n = 9$ pansexual, $n = 3$ asexual, $n = 2$ chose the option "other," and $n = 12$ did not wish to say. Regarding political attitudes on social issues, the mean was $M = 4.42$ ($SD = 1.99$; range: 1 – *very liberal* to 7 – *very conservative*). Regarding political attitudes on economic issues, the mean was $M = 4.61$ ($SD = 1.91$; range: 1 – *very liberal* to 7 – *very conservative*).

After giving consent and receiving instructions on completing the online survey via the Qualtrics platform, participants began a face rating task (Jenkins et al., 2018). In sum, they completed 33 ratings (31 regarding different traits, 1 regarding the perceived attractiveness of

presented faces, and 1 regarding the perceived age of presented people) on 10 randomly selected face rating tasks (330 ratings total) rather than rating all 120 faces chosen for the study (60 pre-treatment & 60 post-treatment; 60 with palsies & 60 with scars). This procedure aimed to reduce the testing burden placed on participants, given a large number of rating participants provide for each face as part of each trial. After the face rating task, participants filled out additional surveys and questions (see the section below).

Measures

Face Rating Task. Photographs of faces with palsies and scars were selected from the ChatLab Facial Anomaly Database (Workman & Chatterjee, 2021). The faces were diverse in age, race, ethnicity, and sex. The structure of the face rating task was adapted from earlier studies (Jamrozik et al., 2019; Workman et al., 2021). Participants completed a total of 10 trials. In each trial, participants were shown a face with a facial anomaly that either had or had not undergone surgical correction to reduce the visual salience of any anomalies. Each face remained on screen while participants rated the face along the 31 dimensions (sincere, tolerant, natured, trustworthy, friendly, helpful, moral, understanding, intelligent, efficient, skilled, confident, creative, capable, foresighted, clever, capable of hunger, capable of fear, capable of pain, capable of rage, capable of desire, capable of pleasure, capable of pride, capable of embarrassment, capable of joy, communicative, knowledgeable about others' feelings, capable of remembering things, capable of telling right from wrong, capable of planning, capable of self-control).

Warmth & Competence. Participants were asked to assess the extent to which people presented in the photographs possessed warmth traits (i.e., sincere, tolerant, good-natured, trustworthy, friendly, helpful, moral, and understanding of others) and competence traits (i.e., intelligent, efficient, skilled, confident, creative, capable, foresighted, and clever) (Jenkins et al., 2018).

Ratings were made using a 100-point scale ranging from 1 – *not at all [trait]* to 100 – extremely *[trait]*. Following the approach used by Jenkins et al. (2018), principal components analysis with varimax rotation was performed on the ratings of the 31 attributes using the "psych" package in R. For use in computational modeling, we calculated overall warmth and competence scores for each recipient.

Attractiveness & Age. Faces were also rated for attractiveness on a scale from 1 – *not at all attractive* to 100 – *extremely attractive*. Participants also reported the perceived age of each face they saw.

Dehumanization. We measured two types of dehumanization: animalistic and mechanistic.

Animalistic Dehumanization. Animalistic dehumanization was assessed by averaging across reverse-scored ratings corresponding to moral sensibility (morality, telling right from wrong, trustworthiness, and good-naturedness) and rationality/logic (planning, self-control, intelligence, and cleverness) (Haslam, 2006). Participants were asked to assess to which extent people presented in the photographs possess the mentioned trait.

Mechanistic Dehumanization. Mechanistic dehumanization was assessed by averaging across reverse-scored ratings corresponding to emotional responsiveness (knowing others' feelings, embarrassment, pride, and joy) and interpersonal warmth (sincerity, friendliness, helpfulness, and tolerance) (Haslam, 2006). Participants were asked to assess the extent to which people presented in the photographs possess the mentioned trait.

Psychological Dispositions. Participants' psychological dispositions were assessed using several scales: the Interpersonal Reactivity Index assessed facets of trait empathy (Davis, 1983), the Three Domains of Disgust scale assessed sensitivity to different kinds of disgust (Tybur et al., 2009), the Social Dominance Orientation scale assessed egalitarianism (Pratto et al., 1994), and the

Procedural and Distributive Just World Beliefs scale assessed beliefs about justice (Lucas et al., 2007, 2011). Analyses of these individual differences in psychological dispositions are beyond the scope of the current manuscript and will be described elsewhere. Participants also reported their demographic characteristics, including age, gender, sexual orientation, education, and political views on social and economic issues.

Preregistered Analysis Plan

We conducted a principal components analysis of the 31 attributes linked to warmth and competence, isolating up to 10 factors with varimax rotation using the "psych" package in R. Linear mixed-effects models were used to test whether the dependent variables (animalistic dehumanization, mechanistic dehumanization, warmth, and competence) were significantly affected by face type (pre-treatment, post-treatment). Random intercepts for the subject and item were modeled. We obtained *p* values for the parameter estimates generated by each model using Satterthwaite's approximation as implemented by the lmerTest package (Kuznetsova et al., 2017). We reported regression coefficients (β), standard errors (SE), and *t*-values generated with the effects package (Fox & Weisberg, 2018). Null models were computed for comparison, and the Akaike information criterion (AIC) was compared, which estimates out-of-sample prediction error. The model with the superior AIC was selected.

Results

First, we conducted the principal components analysis, which resulted in two components based on 31 traits related to warmth and competence (see Table S1). Second, we tested how participants perceived all anomalous faces before and after surgery. Table 1 presents the descriptive statistics for all faces. Figures 1-4 show how all faces were assessed pre- and post-treatment (left side) and how palsies and scars were assessed in a specific domain (right side). Table 2 presents descriptive statistics separately for faces with palsies and scars.

Table 1

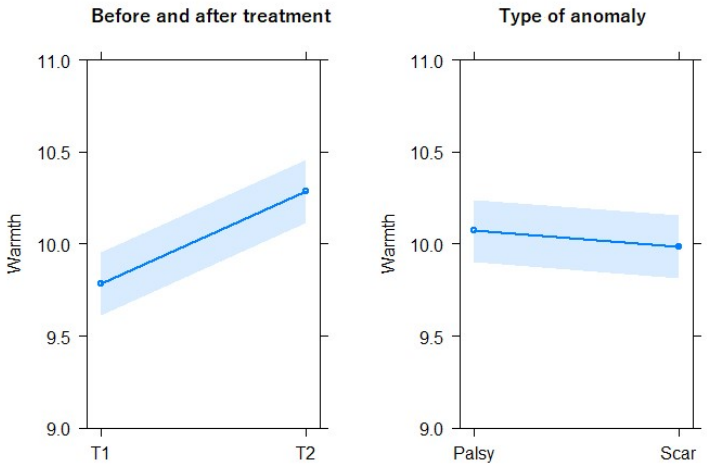
Descriptive Statistics for Warmth, Competence, Animalistic and Mechanistic Dehumanization, Perceived Attractiveness, and Perceived Age Across all Faces

	Warmth	Competence	Animalistic Dehumanization	Mechanistic Dehumanization	Attractiveness	Age
M	10.336	-0.904	43.426	42.914	49.232	50.535
SD	2.957	1.406	17.167	17.266	22.535	17.235
Scale	0.179-17.937	-8.052-4.777	0-100	0-100	0-100	0-100

To examine the effect of the facial anomaly on warmth, a linear mixed model was constructed with warmth as the dependent variable and treatment (pre-treatment | post-treatment) and type of anomaly (palsy vs. scar) as fixed factors. Random intercepts for face stimulus and subject were modeled. There was a significant main effect of treatment (β = 0.50369, *SE* = 0.06612, $t(119.20876) = 7.618$, $p < .001$, AIC = 59773.0) but not of type of anomaly (β = -0.08774, *SE* = 0.06609, $t(119.10689) = -1.328$, $p = .187$). There was no significant two-way interaction between treatment and type of anomaly (β = -0.165603, *SE* = 0.131328, $t(119.086310) = -1.261$, $p = .210$). Anomalous faces were seen as less warm than the same faces after surgery (Figure 1).

Figure 1

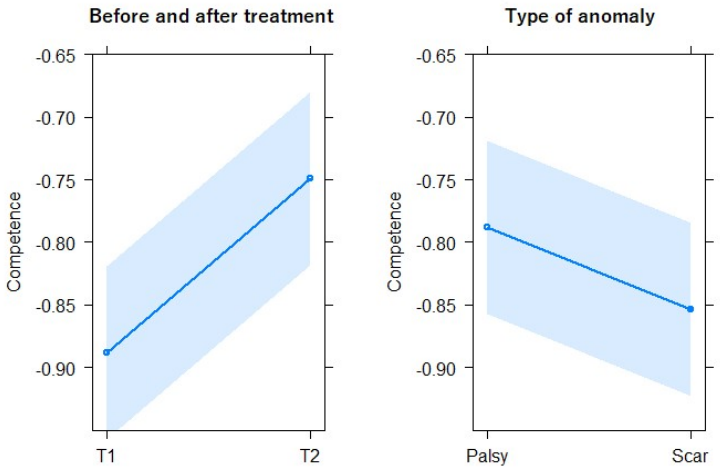
Assessments of Warmth Before and After Treatment (Left Side) and Regarding the Type of Anomaly (Right Side)



To examine the effect of the facial anomaly on competence, a linear mixed model was constructed with competence as the dependent variable and treatment (pre-treatment | post-treatment) and the type of anomaly (palsy vs. scar) as fixed factors. Random intercepts for face stimulus and subject were modeled. There was a significant main effect of treatment (β = 0.17713, *SE* = 0.03645, t(119.07701) = 4.860, $p < .001$, AIC = 35420.2) but not of type of anomaly (β = -0.02791, *SE* = 0.03608, t(118.43279) = -0.774, $p = .441$). There was no significant two-way interaction between treatment and type of anomaly (β = -0.07677, *SE* = 0.05151, t(118.97198) = -1.490, $p = .139$). Anomalous faces before treatment were seen as less competent than surgically corrected faces (Figure 2).

Figure 2

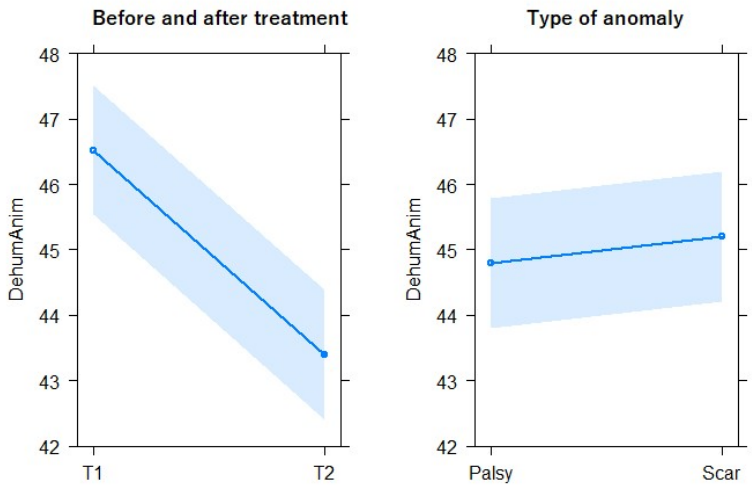
Assessments of Competence Before and After Treatment (Left Side) and Regarding the Type of Anomaly (Right Side)



To examine the effect of the facial anomaly on animalistic dehumanization, a linear mixed model was constructed with animalistic dehumanization as the dependent variable and treatment (pre-treatment | post-treatment) and the type of anomaly (palsy vs. scar) as fixed factors. Random intercepts for face stimulus and subject were modeled. There was a significant main effect of treatment (β = -3.1323, SE = 0.4344, t(119.1701) = -7.211, p < .001, AIC = 115698.4) but not of type of anomaly (β = 0.4140, SE = 0.4342, t(119.0676) = 0.953, p = .342). There was no significant two-way interaction between treatment and type of anomaly (β = 0.93442, SE = 0.86434, t(119.03751) = 1.081, p = .282). Anomalous faces before treatment were dehumanized more than surgically corrected faces (Figure 3).

Figure 3

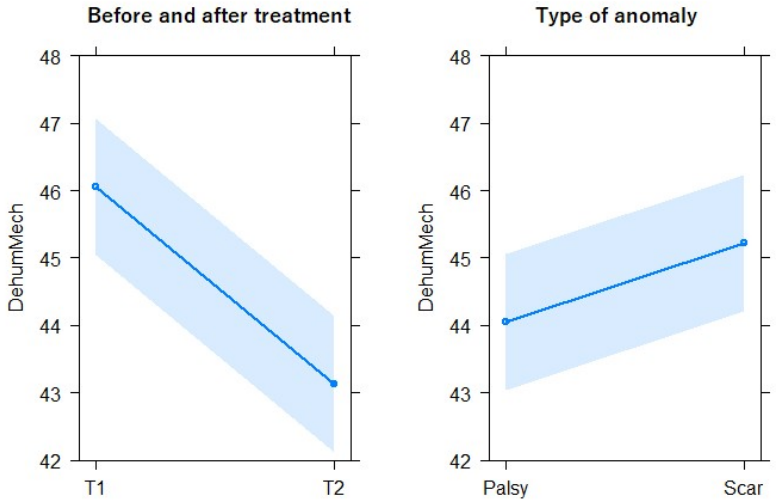
Assessments of Animalistic Dehumanization Before and After Treatment (Left Side) and Regarding the Type of Anomaly (Right Side)



To examine the effect of the facial anomaly on mechanistic dehumanization, a linear mixed model was constructed with mechanistic dehumanization as the dependent variable and treatment (pre-treatment | post-treatment) and a type of anomaly (palsy vs. scar) as fixed factors. Random intercepts for face stimulus and subject were modeled. There was a significant main effect of treatment (β = -3.5877, SE = 0.6245, t(119.3068) = -5.745, p < .001, AIC = 115023.0) but not of type of anomaly (β = 0.5185, SE = 0.6185, t(118.8455) = 0.838, p = .404). There was no significant two-way interaction between treatment and type of anomaly (β = 1.3403, SE = 0.8828, t(119.2303) = 1.518, p = .132). Anomalous faces before treatment were dehumanized more than surgically corrected faces (Figure 4).

Figure 4

Assessments of Mechanistic Dehumanization Before and After Treatment (Left Side) and Regarding the Type of Anomaly (Right Side)



In sum, we confirmed hypothesis 1 (P.1.1.). Anomalous faces were rated as less warm and competent and were dehumanized (animalistic and mechanistic) compared to the same faces after corrective surgery. Regarding hypothesis 2, we did not find differences between faces with scars and palsies for these measured variables (see Table 2).

Table 2

Descriptive Statistics Regarding the Type of Anomaly (Palsy vs. Scar)

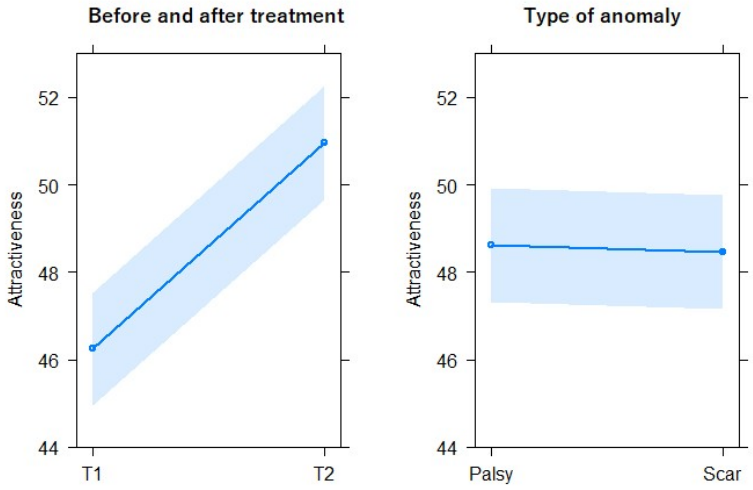
	Group	*N*	*M*	*SD*	*SE*
Warmth	Palsy	6516	10.373	2.973	0.037
	Scar	6544	10.299	2.940	0.036
Competence	Palsy	6516	-0.869	1.371	0.017
	Scar	6544	-0.938	1.440	0.018
Animalistic Dehumanization	Palsy	6516	43.265	17.259	0.214
	Scar	6544	43.588	17.074	0.211
Mechanistic Dehumanization	Palsy	6516	42.341	17.514	0.217
	Scar	6544	43.485	16.998	0.210
Attractiveness	Palsy	6516	49.395	22.695	0.281
	Scar	6544	49.069	22.376	0.277

To examine the effect of the facial anomaly on attractiveness, a linear mixed model was constructed with attractiveness as the dependent variable and treatment (pre-treatment | post-treatment) and a type of anomaly (palsy vs. scar) as fixed factors. Random intercepts for face

stimulus and subject were modeled. There was a significant main effect of treatment (β = 4.7144, *SE* = 0.7026, *t*(119.5058) = 6.710, $p < .001$, AIC = 127094.0), but not of type of anomaly (β = -0.1420, *SE* = 0.7023, *t*(119.4201) = -0.202, $p = .840$), and no interaction between treatment and type of anomaly (β = 0.1725, *SE* = 1.4048, *t*(119.4355) = 0.123, $p = .902$). Anomalous faces before treatment were seen as less attractive than surgically corrected faces after treatment (Figure 5).

Figure 5

Assessments of Attractiveness Before and After Treatment (Left Side) and Regarding the Type of Anomaly (Right Side)

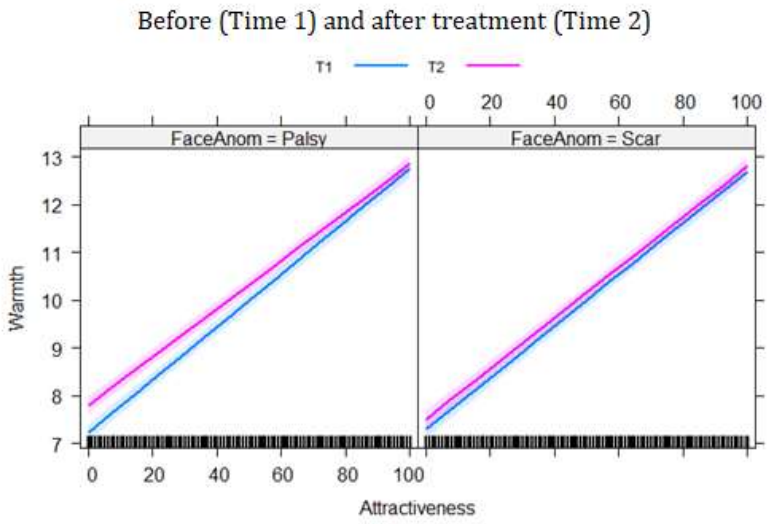


Next, we conducted a linear mixed model with warmth as the dependent variable and treatment (pre-treatment | post-treatment) and the type of anomaly (palsy vs. scar) and attractiveness as fixed factors. Random intercepts for face stimulus and subject were modeled. There was a significant main effect of treatment (β = 5.716e-01, *SE* = 9.055e-02, *t*(5.600e+02) = 6.312, $p < .001$), attractiveness (β = 5.510e-02, *SE* = 1.064e-03, *t*(1.396e+04) = 51.805, $p < .001$), but not of type of anomaly (β = 5.457e-02, *SE* = 8.566e-02, *t*(4.711e+02) = 0.637, $p = .524$).

There was a significant two-way interaction between treatment and type of anomaly (β = -3.570e-01, *SE* = 1.279e-01, *t*(5.593e+02) = -2.791, *p* = < .01), and between treatment and attractiveness (β = -4.734e-03, *SE* = 1.369e-03, *t*(1.350e+04) = -3.459, *p* = < .001) (AIC = 55179.8). Simply put, more attractive faces were seen as warmer, similarly for palsies and scars. Additionally, less attractive faces with palsies after their surgical correction were seen as warmer compared to less attractive faces with palsies before the correction. We found no other interactions (Figure 6).

Figure 6

Assessments of Warmth Before and After Treatment and Regarding the Type of Anomaly and Attractiveness

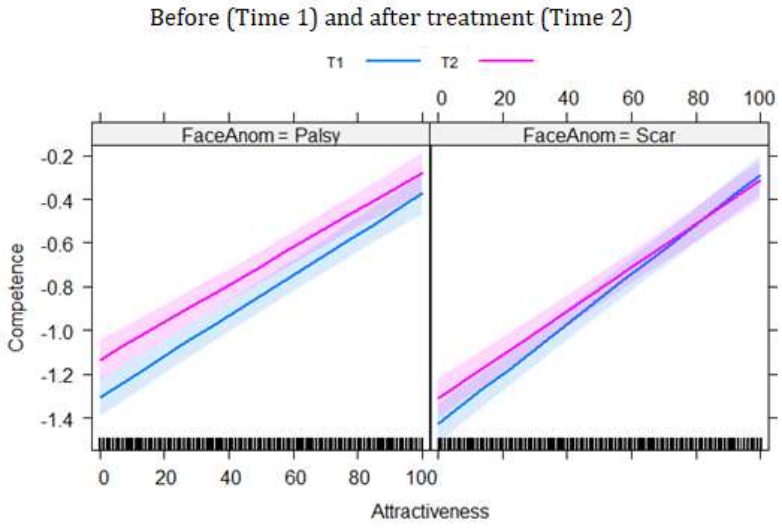


We repeated the same analyses for competence. There was a significant main effect of treatment (β = 1.712e-01, *SE* = 4.602e-02, *t*(5.541e+02) = 3.719, *p* < .001), attractiveness (β = 5.305e-03, *SE* = 5.389e-04, *t*(1.403e+04) = 17.268, *p* < .001), and type of anomaly (β = -1.219e-01, *SE* = 4.354e-02, *t*(4.664e+02) = -2.799, *p* < .01). There was a significant two-way interaction between type of anomaly and attractiveness (β = 2.083e-03, *SE* = 6.684e-04, *t*(1.349e+04) = 3.116, *p* < .01) (AIC = 34713.2). Simply put, more attractive faces were seen as more competent,

similarly for palsies and scars. Additionally, the surgical correction of palsies increased competence perception of corrected faces, no matter if they were seen as less or more attractive. Reading faces with scars, only if they were seen as less attractive, the correction of scars increased the perceived competence of such faces. We found no other interactions (Figure 7).

Figure 7

Assessments of Competence Before and After Treatment and Regarding the Type of Anomaly and Attractiveness

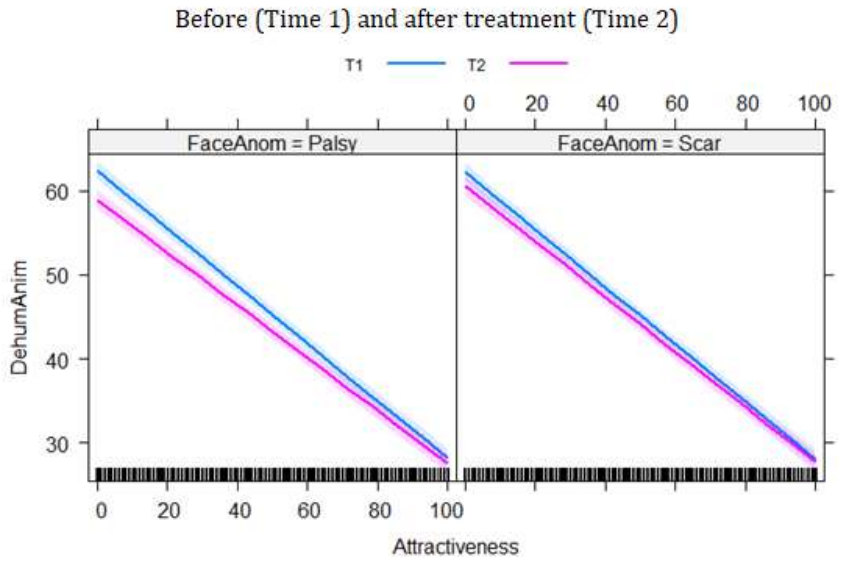


Next, we followed the same analyses for animalistic dehumanization. There was a significant main effect of treatment (β = -3.477e+00, *SE* = 6.284e-01, *t*(5.167e+02) = -5.532, $p <$ .001), attractiveness (β = -3.424e-01, *SE* = 7.201e-03, *t*(1.425e+04) = -47.542, $p <$ .001), but not for type of anomaly (β = -2.035e-01, *SE* = 5.955e-01, *t*(4.368e+02) = -0.342, p = .733). There was a significant two-way interaction between treatment and type of anomaly (β = 1.844e+00, *SE* = 8.878e-01, *t*(5.161e+02) = 2.077, $p <$ .05) and between treatment and attractiveness (β = 2.879e-02, *SE* = 9.329e-03, *t*(1.354e+04) = 3.086, $p <$ .01) (AIC = 111692.9). Simply put, more attractive anomalous faces were dehumanized less. Additionally, we observed lower dehumanization of less

attractive faces with palsies after their surgical correction compared to less attractive faces with palsies before the correction. We found no other interactions (Figure 8).

Figure 8

Assessments of Animalistic Dehumanization Before and After Treatment and Regarding the Type of Anomaly and Attractiveness

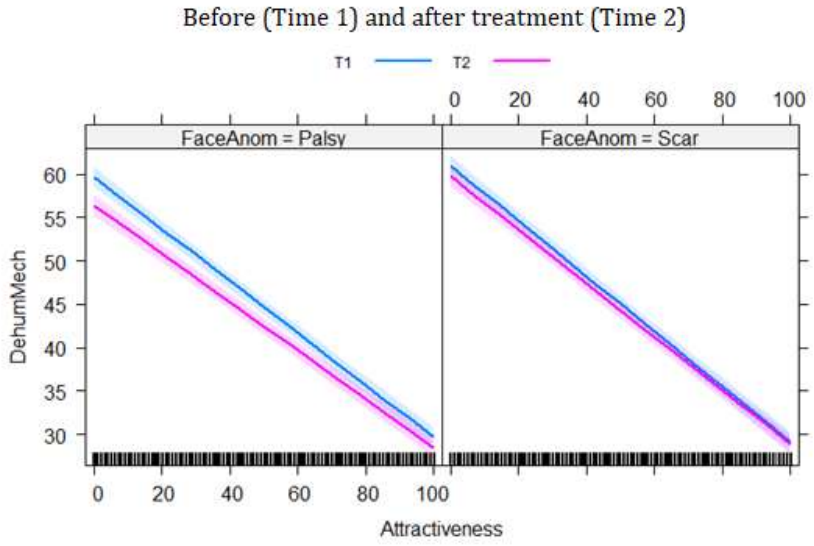


We followed the same analyses for mechanistic dehumanization. There was a significant main effect of treatment (β = -3.247e+00, *SE* = 6.454e-01, *t*(4.466e+02) = -5.031, $p < .001$), attractiveness (β = -2.996e-01, *SE* = 7.133e-03, *t*(1.415e+04) = -42.001, $p < .001$), and for type of anomaly (β = 1.304e+00, *SE* = 6.136e-01, *t*(3.813e+02) = 2.125, $p < .05$). There was a significant two-way interaction between treatment and type of anomaly (β = 2.038e+00, *SE* = 9.118e-01, *t*(4.458e+02) = 2.235, $p < .05$), between treatment and attractiveness (β = 2.063e-02, *SE* = 9.219e-03, *t*(1.353e+04) = 2.238, $p < .05$), and between the type of anomaly and attractiveness (β = -1.850e-02, *SE* = 8.870e-03, *t*(1.349e+04) = -2.086, $p < .05$) (AIC = 111581.6). Simply put, more attractive faces were dehumanized less. Additionally, we observed lower dehumanization of less

attractive faces with palsies after their surgical correction compared to less attractive faces with palsies before the correction. We found no other interactions (Figure 9).

Figure 9

Assessments of Mechanistic Dehumanization Before and After Treatment and Regarding the Type of Anomaly and Attractiveness



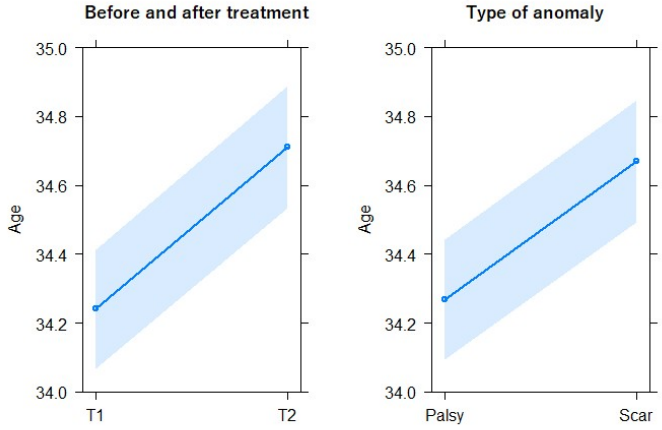
In sum, perceived attractiveness interacted with treatment to predict warmth, animalistic and mechanistic dehumanization. More attractive faces were seen as warmer than less attractive faces, no matter if the face was corrected or not. Similarly, more attractive faces were dehumanized less (animalistically and mechanistically) than less attractive faces, no matter if the faces were corrected or not. Attractiveness interacted with the type of anomaly, with less attractive faces with scars seen as less competent and less mechanistically dehumanized than faces with palsies.

Lastly, we focused on perceived age. We conducted a linear mixed model with age as the dependent variable and treatment (pre-treatment | post-treatment) and the type of anomaly (palsy vs. scar) as fixed factors. Anomalous faces before treatment were seen as younger than corrected

faces (β = 4.718e-01, *SE* = 5.298e-02, *t*(1.206e+03) = 8.904, $p < .001$). Faces with scars were seen as older than faces with palsies (β = 4.007e-01, *SE* = 5.301e-02, *t*(1.206e+03) = 7.560, $p < .001$) (Figure 10). We found no other significant interaction, and AIC = -281547.6.

Figure 10

Assessments of Age Before and After Treatment (Left Side) and Regarding the Type of Anomaly (Right Side)



Discussion

We aimed to understand how faces with scars and palsies before and after surgery are seen regarding their warmth and competence and whether they are dehumanized animalistically or mechanistically. We found that faces (regardless of the type of anomaly) before correction were seen as less warm and competent, confirming the "anomalous-is-bad" stereotype (Workman et al., 2021). We observed more mechanistic and animalistic dehumanization toward faces with facial anomalies regardless of the type of anomaly. We also found that all faces with anomalies were assessed as less attractive than the same faces after surgical correction. Moreover, the attractiveness of anomalous faces may have an impact on the assessment of inner traits and dehumanization. Specifically, more attractive faces were considered warmer and more competent,

both for palsies and scars. Seeing faces as more attractive also decreased the level to which they were dehumanized.

Our study confirms and adds to our understanding of the "anomalous-is-bad" stereotype. Not only are attractive faces seen more positively, but faces with anomalies elicit more negative evaluations compared to the same faces before the surgery. These results have practical implications. If people with facial anomalies are seen as less competent, they may be victims of stereotyping in workplaces and schools, and other environments. They might also be seen as less warm. Based on a long line of research (Brambilla et al., 2011, 2021; Brambilla & Leach, 2014; Goodwin et al., 2014; Landy et al., 2016; Stasiuk et al., 2023), we know that others' morality, including their warmth, is a critical trait in forming impressions. Being seen as less warm (and less moral) may damage individuals' quality of social interactions as people need to think that they are good and that they are seen as good by others (Prentice et al., 2019; Strohminger, 2018). Moreover, being dehumanized is harmful, as it strongly impacts self-assessments. Dehumanized people see themselves in a bad light, as less intelligent or not worthy of living, and feel shame, guilt, sadness, or anger (Bastian & Haslam, 2011). Such destructive emotions and negative thoughts about oneself as an effect of dehumanization lower the quality of life and also impact mental health by increasing anxiety and depression (Fontesse et al., 2021).

Our study brings a new piece of knowledge regarding the effects of anomalies. Contrary to past studies with diverse stimuli (e.g., Workman et al., 2021), we focused on two types of anomalies, making it possible to test for differences between their effects. One could imagine that scars signal lower warmth and higher competence (as often depicted in movie villains, or historically in dueling scars) in a way that palsies might signal lower competence if thought to signal compromised health. However, we did not observe such differences. Any facial anomaly

made participants see them as less warm, less competent, and more dehumanized animalistically and mechanistically. Perhaps both anomalies activate pathogen disgust (Tybur et al., 2009), but we need more studies to investigate this possible mechanism. Some anomalies may work differently than scars and palsies. Just a glance is enough for people to assess the kind of person others are, whether they can be trusted and are hardworking. People with facial anomalies are subject to discrimination (Haslam & Loughnan, 2014). The first impressions based on the perception of anomalous faces have many social consequences, from avoiding sitting next to someone who has facial anomaly (Houston & Bull, 1994), or not being willing to date them (Mojon-Azzi et al., 2008; Robert et al., 1998), to serious violence (Madera & Hebl, 2012; Strauss et al., 2007; Tartaglia et al., 2005). Identifying mechanisms that enable the "anomalous-is-bad" bias would help in devising interventions aimed at reducing or eliminating the bias.

We consider et least three possible over generalization mechanisms for the negative bias. First, the bias may be related to "familiar-face overgeneralization" (the adaptive value of differentiating friends from foes or known individuals from strangers produces a strong tendency to respond to face familiarity, which generalizes to misattributed impressions of strangers who vary in their resemblance to known individuals) (Zebrowitz, 2017). Second, to "emotional-face overgeneralization" (the adaptive value of responding appropriately to emotional expressions, such as avoiding an angry person or approaching a happy person, produces a tendency to respond to facial qualities that reveal emotions, and this tendency is overgeneralized to misattributions of people whose facial structures resemble particular emotional expressions) (Zebrowitz, 2017). Third, to "unfit-face overgeneralization" (the adaptive value of recognizing evolutionarily unfit people with genetic anomalies or disease), which allows one to reject them as mates or to avoid contagion, produces a strong tendency to respond to facial qualities that mark low fitness. This is

overgeneralized to misattributions of unattractive people whose facial features resemble those of individuals who are low in fitness (Zebrowitz, 2017). This last mechanism is challenged, since culture more than an evolutionary adaptation mechanism in some settings might account source for negative judgments of faces with scars (Workman et al., 2022).

Our study has limits. Testing only one WEIRD sample (Henrich et al., 2010) limits our ability to make general conclusions about other cultures. We have evidence that culture may play an important role in generating this bias (Workman et al., 2022). Maybe some anomalies like scars signal positive traits like bravery, such as dueling scars in 19th Century, Germany. Second, our study examined social perceptions of two kinds of anomalies, but many craniofacial anomalies exist whose consequences for the "anomalous-is-bad" bias remain to be investigated. Nevertheless, this work suggests that the type of anomaly, per se, might not matter. Moreover, maybe some anomalies do not necessarily impact a person's perception, or maybe they even impact positively. Third, we tested only warmth, competence, and dehumanization, so we still need more studies to understand whether the "anomalous-is-bad" stereotype appears for other personality assessments such extraversion or neuroticism, or other characteristics like politeness, or even political or religious preferences.

Conclusion

We found that people with facial anomalies are associated with negative characteristics. Specifically, anomalous faces with scars and palsies were seen as less warm, competent, and dehumanized (in animalistic and mechanistic ways). Our study brings new knowledge supporting the "anomalous-is-bad" stereotype. Because millions of people worldwide experience prejudice as a result of having a facial anomaly, our study has serious practical implications and might inform interventions strategies to prevent bias towards people with visible differences.

Open Practices

The materials, data, and analysis code are available from: https://osf.io/kf654/?view_only=f99d62d48ceb4bf68379a7bf44d4dc6b. This study was preregistered: https://osf.io/m56wb/?view_only=6f843e18a74a48bcbfa071830ec4a428.

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