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Facial Scars: Do Position and Orientation Matter?

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Short Running Head: Facial Scars: What Matters?

Abstract

Purpose

This study tested the core tenets of how facial scars are perceived by characterizing layperson response to faces with scars. We predicted that scars closer to highly viewed structures of the face (i.e., upper lip and lower lid), scars aligned against resting facial tension lines, and scars in the middle of anatomic subunits of the face would be rated less favorably.

Methods

Volunteers aged 18 and older from the United States were recruited through Amazon's Mechanical Turk to complete a face rating survey. Scars were digitally added in different locations and orientations for a total of 14 unique scars added to each face.

Each participant rated 50 different faces on confidence, friendliness, and attractiveness. Data were analyzed using linear mixed effects models (LMEMs).

Results

A total of 88,850 ratings (82,990 scarred, 93.4%) for attractiveness, friendliness, and confidence were analyzed. In univariate LMEMs, the presence of a facial scar did not significantly impact attractiveness (β=0.016, SE=0.014, z=1.089, p=0.276). A second set of LMEMs identified interactions between location, subunit placement, and orientation to facial tension lines. Scars located on the lower lid mid subunit perpendicular to facial tension lines were rated less attractive (β=-0.065, SE=0.028, z=-2.293, p=0.022).

Conclusions

On average, a single well-healed facial scar does not negatively affect first impressions of attractiveness, confidence, or friendliness. Specific scar location and orientation combinations, however, such as a perpendicular scar at the mid-lower eyelid, may result in lower perceived attractiveness, confidence, and friendliness.

Introduction

Plastic surgeons spend considerable time and effort trying to minimize the severity of lacerations and scars, especially on the face. Beyond the initial repair, there is a large industry for scar care, which generated $19.2 billion in revenue in 2017 and is expected to surpass $34 billion by 2023, demonstrating the public's interest in achieving favorable results.[1] Our faces are vital to our identities and bear a significant portion of the burden for self-expression. Yet, the social consequences of well-healed facial scars are poorly understood.

Character inferences are made in a fraction of a second [2] and an "anomalous-is-bad" stereotype reflects negatively biased attitudes towards people with craniofacial anomalies like scars.[3-5] These negative biases are evident in both implicit and explicit attitudes.[3-5] Explicit biases manifest as both overall negative beliefs held toward a group and harsher character inferences about individuals with facial anomalies relative to typical faces.[4, 5] Not all anomalies evoke the same responses, and worse social penalties are suffered by people with large anomalies closest to the center of the face.[6]

The fundamental teachings of facial incisional design dictate that surgeons should make incisions away from highly viewed structures of the face, in line with resting facial tension lines, and position scars at borders of anatomic subunits of the face to reduce appearance-related burden.[7-19] The purpose of this study was to challenge these core tenets of facial scar design by characterizing layperson response to faces with well-healed scars and identify scar factors that may warrant scar revision. Specifically, we examined whether judgments of attractiveness and character inferences depend on facial scar placement and orientation. We predicted that scars closer to highly viewed structures of the face (i.e., the upper lip and lower lid), scars going

against resting facial tension lines, and scars in the middle of anatomic subunits of the face would be rated less favorably.

Methods

Study Population

This study was approved by the Institutional Review Board at the University of Pennsylvania. Volunteers aged 18 and older from the United States were recruited through Amazon's Mechanical Turk.[20] This study was pre-registered at https://osf.io/9th5x.

Stimuli Generation

Fifty photographs of non-anomalous faces with neutral expressions were selected from the Chicago Face Database.[21] The photographs were characterized by equal distributions of male (n=25, 50.0%) and female subjects from different racial and ethnic backgrounds - Caucasian (n=30, 60.0%), Black (n=7, 14.0%), Asian (n=3, 6.0%), Hispanic/Latino (n=10, 20.0%) - approximating the racial and ethnic diversity of the United States population (Table 1).[21] Stimuli were selected to balance the number of attractive, average, and unattractive faces according to normative ratings included with the Chicago face database (average attractiveness of 3.58 (SD 0.77) out of 5).

Scars were digitally rendered onto each of the 50 faces, with half placed on the face's right side (n=25, 50.0%). Publicly available images of scars were sourced from the internet. All images were manually edited by (ZDZ) in Adobe Photoshop 2020 (Adobe, San Jose, California). Scars were placed at four locations: forehead (F), lower eyelid (E), cheek (C), or upper lip (L), in the middle (M) or border (B) of anatomic subunits, and by orientation parallel (=) or perpendicular (+) to resting facial tension lines.

An anatomic subunit mask was overlaid onto each face to assist in scar placement.[22] (Figure 1) Langer's lines were estimated based on previously published figures.[7, 13, 23, 24] Scar length was adjusted to each subjects intercanthal distance besides lip scars, which were shortened to the length of the philtral ridge. Scars on each subject's face were manually edited to achieve as natural of a look as possible, blending the scars with the skin tone of the subject with equal contrast and severity throughout the face. Scars varied slightly between subjects. Scars were matched on severity and screened for authenticity. Unbalanced or unnatural scars were flagged for additional editing. The scars were hypo-pigmented and roughly 1-2mm wide, thus representing an average one-year post-operative outcome. The scars would be graded as 1/13 on the Vancouver scar scale.[25] Scar names were abbreviated (Location, Subunit, Orientation). For example, a scar on the forehead in the middle of the subunit perpendicular to resting tension lines was abbreviated (FM+). Fourteen scars were placed (FM=, FM+, FB=, FB+, EM+, EM=, EB=, CM+, CM=, CB=, LM=, LM+, LB=, LB+) on each face. An example of each scar is given in Figure 1. Four representative photos of faces participants saw can be viewed in Figure 2.

Survey Design

After giving consent and receiving instructions on how to complete the survey, which took 15-20 min, participants began the face rating task. Participants rated images of 50 different faces. Participants saw only one randomly selected version of the 15 possible variations with either no scar or visible scars appearing in different locations and along different orientations. Each photograph was presented for 2.5 seconds before participants were redirected to a separate page to provide their ratings along a seven-point-semantic-differential scale to examine their perceptions of the photographs in terms of confidence, friendliness, and attractiveness.[2] The

version of each face shown to participants was chosen in a counterbalanced fashion to guarantee a sufficient number of ratings for each scar.

After completing the face rating task, participants completed several self-report assessments of social psychological dispositions (not reported here). Three attentional checks were embedded during the face rating portion of the survey. Participants were compensated $2.64 for their time, which was calculated based on an estimated completion time of around 20 minutes paid at a rate of $8 per hour.

Statistical analysis

An *a priori* power analysis with effect sizes based on face rating dimensions from Jamrozik *et al.* dictated that to achieve 80% power we would need 102 responses per face.[4] We increased this to 120 ratings to combat exclusions for low-quality data. There are 15 possible versions of each of 50 different faces, for a total of 750 face images. With 120 ratings needed for each dimension for each of the 750 images, around 90,000 sets of ratings were required. Since each participant only rated one version of each of the 50 different faces, a minimum sample size of 1,800 participants was required.

Linear mixed effect models (LMEMs) tested whether each dependent variable (attractiveness, confidence, and friendliness) was affected by the presence or absence of scarring. LMEMs account for both fixed and random effects and their interactions—in our case, scar position and orientation. The outputs include betas, which represent the slopes of effects as a function of participant ratings, standard errors for the effects, Z-values that represent standard deviations of effects from the means for the cohort, and p-values to determine the significance of results. Unscarred faces were then removed from the data set and additional LMEMs tested whether specific locations (anatomic subunit: forehead, undereye, cheek, and upper lip; within-subunit:

middle and border) and scar orientations (parallel and perpendicular to resting facial tension lines) were more harshly penalized. For comparison, a null model was computed and its Akaike information criterion (AIC) compared. Models with a higher AIC than the null model were determined to be non-predictive. Results were considered significant at a threshold of α=0.05 (two-tailed). Participants were excluded if they self-reported bad data quality[26] or failed two or more attentional checks. All statistical analyses were performed with RStudio 1.3 (The R Foundation for Statistical Computing; Vienna, Austria). The LmerTest R package was used for linear mixed effects modeling.[27] Power analyses were conducted in G*Power.[28]

Results

Demographics of Survey Respondents

A total of 1,802 MTurk workers completed the survey, of which 25 were excluded for failing attentional checks or self-reporting bad data quality. Of the remaining 1,777 participants, 974 (54.8%) identified as male with the majority of responders reporting they were white (n=1,232, 69.3%) or Black/African American (n=246, 13.8%) (Table 2). Respondents were on average 39 years old (SD 12) with an average of 15 years of education (SD 2.5). The bulk of respondents were heterosexual (n=1,445, 81.3%), while 308 respondents (17.3%) were LGBTQ+.

Scar Design Analysis

A total of 88,850 ratings (82,990 scarred, 93.4%) were included in the final analysis for attractiveness, friendliness, and confidence. Unscarred faces were rated an average of 4.25 (SD 1.57) for attractiveness, 4.23 (SD 1.51) for friendliness, and 4.55 (SD 1.43) for confidence. While scarred faces were rated an average of 4.26 (SD 1.55) for attractiveness, 4.27 (SD 1.50) for friendliness, and 4.53 (SD 1.43) for confidence. In our univariate LMEMs, the presence of a facial scar did not have a significant impact on attractiveness (β=0.016, SE=0.014, z=1.089,

p=0.276), with a superior AIC detected for the null model. Scars did not have an overall effect on confidence (β=-0.026 SE=0.014, z=-1.772, p=0.765) (Table 3). Faces with scars were rated *friendlier* than their non-scarred counterparts (β=0.047, SE=0.015, z=3.181, p=0.001).

A second set of LMEMs identified interactions between location, subunit placement, and orientation to resting facial tension lines. The following models' reference groups for each variable were: location, cheek; orientation, parallel; subunit, border. Respondents were not influenced by locations of scars alone in rating attractiveness (forehead, p=0.056; lower lid, p=0.184; upper lip, p=0.592) (Table 4). Faces with scars located on the forehead were rated more confident (β=0.041, SE=0.020, z=2.062, p=0.039) and friendlier (β=0.052, SE=0.020, z=2.556, p=0.011), while scars on the lower lid and upper lip did not impact on confidence ratings (p=0.115, p=0.338). Scars on the lower lid (p=0.222) and upper lip (p=0.055) did not affect friendliness.

Next, we examined if there was any effect of scar orientation regarding resting facial tension lines or positioning in anatomic subunits of the face. In our cohort, there was no significant influence on attractiveness (mid, p=0.371; perpendicular, p=0.856), friendliness (mid, p=0.502; perpendicular, p=0.929), or confidence ratings (mid, p=0.136; perpendicular, p=0.862).

Finally examining interactions between factors, we found that scars located in the middle of the subunit of the lower lid were rated more attractive (β=0.058, SE=0.028, z=2.038, p=0.042) and friendlier (β=0.058, SE=0.029, z=2.023, p=0.043). However, when isolating scars that were perpendicular to resting facial tension lines in the middle of the lower lid subunit, we observed worse ratings for attractiveness (β=-0.065, SE=0.028, z=-2.293, p=0.022), confidence (β=-0.072, SE=0.028, z=-2.546, p=0.011), and friendliness (β=-0.094, SE=0.029, z=-3.27, p=0.001). While examining single factors, scars on the forehead were rated as more confident.

When we took subunit status into account as well, however, scars mid subunit on the forehead were rated less confident (β=-0.058, SE=0.028, z=-2.04, p=0.041). Lastly, as noted above, the upper lip location alone had no impact on confidence ratings. Scars in the middle of the upper lip subunit, however, were rated less confident (β=-0.069, SE=0.028, z=-2.416, p=0.016). The dispersion of participant responses (attractiveness, friendliness, and confidence) as a function of scar location, subunit, and orientation is visualized in **Figure, Supplemental Digital Content 1,** INSERT HYPER LINK. (Dispersion is visualized using raincloud plots. Each raincloud plot is comprised of a boxplot overlaid on jittered participant responses (left) together with a violin plot (right). Raincloud plots for faces without scars appear to the left in gray. Raincloud plots for scars in different locations, subunits, and orientations are shown on the right in color. A. Raincloud plots for attractiveness ratings. B. Raincloud plots for friendliness ratings. C. Raincloud plots for confidence ratings.)

Exploratory Analysis of Face-Specific Factors

The literature describes a left gaze preference when viewing faces, leading one to believe that left-sided scars might exacerbate effects on ratings.[29, 30] In our cohort, however, the scar laterality did not significantly influence ratings (higher AIC compared to the null model). We then explored whether demographic features of the face stimuli impacted ratings. Models that included sex, race, and ethnicity were also non-significant.

Discussion

As evidence for the "anomalous-is-bad" stereotype mounts, it is important for surgeons to understand how scars from elective operations affect the social perceptions of their patients. In this study, we present the first large-scale systematic investigation of several techniques surgeons may be able to use to hide elective facial scars, including positioning scars away from highly viewed structure of the face, placing scars on the borders of anatomic subunits, and orienting

scars with resting facial tension lines. Contrary to our predictions, we found that a single well-healed scar generally does not affect individuals' first impressions of perceived attractiveness or confidence negatively and may even increase perceived friendliness. These data are both surprising, and perhaps welcome news for plastic surgeons who, regularly counsel anxious patients who present with conditions that mandates a surgical incision be made on the face. Though, the origin of the scar does not have to be surgical; it could come as result of trauma or other mechanisms and as long as the scar heals reasonably well, these data from scar rated 1/13 on the Vancouver Scar Scale suggest that the patient's face will not necessarily be subject to an "anomalous is bad" stereotype.

When isolating effects of location alone, there were no effects on attractiveness, but scars on the forehead were rated friendlier and more confident compared to the cheek reference group. Neither subunit position nor scar orientation to resting facial tension lines had a significant effect in isolation. We identified one scar—lower lid mid subunit perpendicular to resting facial tension lines—that negatively affected attractiveness, friendliness, and confidence ratings. The effect sizes observed for this scar were small, however, with the largest effect equating roughly 2% of the overall rating value.

On the surface, the lack of effects we report may appear unexpected. Similar results were seen in Burriss et al., who found that raters prompted to rate attractiveness in the context of a long-term relationship showed no difference for scarred relative to typical faces.[31] When female respondents were prompted to rate attractiveness in a short-term relationship, they rated males with scars as *more* attractive than their non-scarred counterparts. A review of facial anomalies as represented in classic movies that are viewed by offers a potential explanation. Villains are often portrayed with significant deformities and, in the case of facial scars, they are not well-healed,

deform anatomic structures such as eyelids, and are usually numerous.[32] Characters who play heroes are also sometimes depicted with facial scars, but which are subtler, do not cause anatomic deformation, and less numerous. The depiction of well-healed facial scars on heroes, which could be perceived to have resulted from noble conquest, may have downstream consequences for public perceptions and could account for the lack of significant adverse effects detected in our study.

Eye-tracking studies demonstrate that the eyes and perioral region are the most viewed structures, followed by the cheeks.[33-37] Consequently, we predicted that scars close to highly viewed structures of the face (i.e., the upper lip and lower lid) would be rated unfavorably. In our study, we predicted that scars on the lower lid and upper lip would be rated most unfavorably. In our cohort, we did not observe a clear negative pattern for the lower lid and upper lip locations. However, the forehead was the only location that had a significant effect, having been rated more confident and friendlier compared to the check location. The forehead result is consistent with visual gaze preferences. Previous work demonstrated that individuals with gross defects centrally located on the face suffered greater social penalties and were rated less attractive than people with defects in the periphery.[6] The scars presented in this study were considerably less severe than the anomalies in Dey *et al.* [6] We believe a severity threshold exists for observing a consistent location effect, with a single well-healed facial scar remaining below this threshold. The recommendation to place incisions in line with resting tension lines and on the border of anatomic subunits of the face has been recommended since at least the 1950s and is still recommended today.[7-19, 38, 39] The effects of scar orientation and position relative to anatomic subunits on attractiveness have not, to the authors' knowledge, been studied rigorously. Scar healing in reference to skin tension lines has been explored, with wounds or incisions parallel to

resting tension lines noted to heal better.[13, 40] Incisions under tension can induce a wider or hypertrophic scar[41-43], which can to some degree be improved by post-op taping.[44] Although perpendicular scars were not wider in this study, we hypothesized that the perpendicular orientation violates normal lines of the face and contributes to the teaching that a scar in the middle of anatomic subunits of the face will be more visible. Consequently, we predicted that scars perpendicular to resting tension lines and in the middle of anatomic subunits, a so-called "two-hit" hypothesis, would be rated harsher. However, no consistent pattern emerged in our cohort.

Notably, the worst scar in our study (lower lid, middle subunit, perpendicular), three "hits", violated all the core tenets tested, and indeed was judged to have a negative effect on appearance. Wherever possible, during an elective lesion excision for instance, a surgeon should avoid placing scars in the lower lid, mid subunit, perpendicular to facial tension lines The general public is likely not as discerning about the finer details of scars as plastic surgeons. That said, while they may be insensitive to minor changes that would be notable to those with years of training and practice, they represent the true audience for scars. Notwithstanding the data presented in this manuscript, the authors still agree with the fundamental principles of facial scar design and recommend their continued use. In settings where this is not possible, surgeons can still report to patients that a facial scar that heals well is likely to have little impact on perceived attractiveness, friendliness, and confidence. Well healed scars that even violate all three principles have minimal effects and likely would not benefit from scar revision.

This study is not without limitations. Previous literature used various scar stimuli design methods, including scarring generated by professional makeup artists[45, 46], digitally altered greyscale images[31], and digitally altered full-color images.[47-49] Given the study design, we

needed over 700 unique photos. The only reasonable solution was to digitally alter images of typical faces. The decision to use full-color images made generating the stimuli considerably more challenging. Scars could not simply be moved to different locations and orientations as lighting, color, texture, and contour were different. To balance scar contrast and create realistic images, detailed edits included color correction, brightness alterations, and blending. These edits may have created minor imbalances, even though scars were screened and flagged for further editing before approval for final use. Stimuli were standardized on features such as scar length, scar width, scar characteristics, numbers of scars, facial expression, age, etc. Adding additional factors like racial differences or hypertrophic scar would dramatically increase the number of digitally altered images needed to maintain adequate statistical power and reliability for the face ratings. Participants saw both scarred and unscarred faces, which could allow raters to identify the study's purpose and causing them to respond unnaturally. This concern was raised in Burriss *et al.*[31] We doubt the general public has explicit knowledge of facial tension lines and anatomic subunits of the face required to modulate responses to specific scars. We limited our stimuli, to White, Black, Asian, and Hispanic faces. Other racial and ethnic groups may be affected differently. Notably, the scars presented in this study are mild, with a rating of 1/13 on the Vancouver scar scale, and may represent a better post-operative outcome than some patients attain. We cannot generalize the effects reported here to other types and quantities of facial scars.

Future research will be directed towards identifying characteristics of unfavorable scars that warrant scar revision. Further, future work should examine how the characteristics of respondents (e.g., race, sex, gender identity, age, disgust sensitivity) influences shape attitudes towards individuals with facial scars.

Conclusion

On average, a single well-healed facial scar does not negatively affect first impressions of attractiveness, confidence, or friendliness. Specific scar location and orientation combinations, however—such as a perpendicular scar of the lower eyelid subunit—may be an outlier in this regard, resulting in lower perceived attractiveness, confidence, and friendliness.

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Figure Legends

Figure 1. Example Face with Scar Stimuli.

Raw image of a face adapted from The Chicago Face Database (Top Left). Anatomic subunit mask overlaid onto face to assist in scar placement (Top Right). All 14 unique scars placed on a single face demonstrating balanced severity at each location (bottom). 1) Forehead middle subunit parallel 2) Forehead border subunit parallel 3) Forehead middle subunit perpendicular 4) Forehead border subunit perpendicular 5) Lower lid middle subunit perpendicular 6) Lower lid middle subunit parallel 7) Lower lid border subunit parallel 8) Cheek border subunit parallel 9) Cheek middle subunit parallel 10) Cheek border subunit perpendicular 11) Upper lip border subunit parallel 12) Upper lip middle subunit parallel 13) Upper lip middle subunit perpendicular 14) Upper lip border subunit perpendicular. (Used with permissions, from Ma, Correll, & Wittenbrink (2015). The Chicago Face Database: A Free Stimulus Set of Faces and Norming Data. Behavior Research Methods, 47, 1122-1135.)

Figure 2. Representative Images Viewed in Face Rating Task

Hispanic female with forehead mid subunit perpendicular scar (top left). White male with lower low border subunit parallel scar (top right). Black male with cheek middle subunit perpendicular scar (bottom left). Asian female with upper lip middle subunit perpendicular scar (bottom right). (Used with permissions, from Ma, Correll, & Wittenbrink (2015). The Chicago Face Database: A Free Stimulus Set of Faces and Norming Data. Behavior Research Methods, 47, 1122-1135.)

Table Legends

Table 1. Demographic Features of Face Stimuli

N, number; SD, standard deviation

Table 2. Survey Respondents Demographics

N, number; SD, standard deviation; LGBTQ+, Lesbian Gay Bisexual Transsexual Queer Plus

Table 3. Effects of Scars on Attractiveness, Friendliness, and Confidence Ratings

SE, standard error.

*Statistical analysis comparing attractiveness, friendliness, and confidence ratings based on the presence or absence of a facial scar were performed using Linear Mixed Effects Models with $p<0.05$ denoting significance.

Table 4. Interaction of Scars location, Orientation and Subunit Placement on Attractiveness, Friendliness, and Confidence Ratings

SE; standard error

*Statistical analysis comparing attractiveness, friendliness, and confidence ratings based on scar location (reference: cheek), orientation (reference: parallel), and subunit location (reference: border subunit) were performed using Linear Mixed Effects Models with $p<0.05$ denoting significance.

Supplemental Figures

Supplemental Digital Content 1. See Figure, which shows the dispersion of participant responses (attractiveness, friendliness, or confidence) as a function of scar location, subunit, and orientation. Dispersion is visualized using raincloud plots. Each raincloud plot is comprised of a boxplot overlaid on jittered participant responses (left) together with a violin plot (right). Raincloud plots for faces without scars appear to the left in gray. Raincloud plots for scars in different locations, subunits, and orientations are shown on the right in color. A. Raincloud plots for attractiveness ratings. B. Raincloud plots for friendliness ratings. C. Raincloud plots for confidence ratings.

Table 1. Demographic Features of Face Stimuli

	N (%)
Total Faces	50
Sex	
Male	25 (50.0)
Female	25 (50.0)
Race/Ethnicity	
White	30 (60.0)
Black or African American	7 (14.0)
Asian	3 (6.0)
Hispanic	10 (20.0)
Scar Side	
Right	25 (50.0)
Left	25 (50.0)
Average Age (SD)	25.0 (2.5)
Average Normed Attractiveness (SD)	3.58 (0.77)

N; number, SD, standard deviation

Table 2. Survey Respondents Demographics

	N (%)
Total Respondents	1777
Sex assigned at Birth	
Male	927 (52.2)
Female	742 (41.8)
Preferred not to Answer	108 (6.1%)
Gender Identity	
Male	974 (54.8)
Female	776 (43.7)
Trans/Gender Nonconforming	13 (0.7)
Preferred not to Answer	14 (0.8)
Race/Ethnicity	
White	1232 (69.3)
Black or African American	246 (13.8)
Asian	131 (7.4)
American Indian	7 (0.4)
Hispanic	68 (3.8)
Multi	74 (4.2)
Other	2 (0.1)
Preferred not to Answer	17 (1.0)
Sexuality	
Heterosexual	1445 (81.3)
LGBTQ+	308 (17.3)
Preferred not to Answer	24 (1.4)
Handedness	
Right	1613 (90.8)
Left	164 (9.2)
Average Age (SD)	39 (12)
Average Years of Education (SD)	15 (2.5)

N; number, SD; standard deviation, LGBTQ+; Lesbian Gay Bisexual Transsexual Queer Plus,

Table 3. Effects of Scars on Attractiveness, Friendliness, and Confidence Ratings

Fixed Effects	β	SE	Z-Value	p
		Attractiveness		
Intercept	4.27	0.083	51.324	<0.001
Scar	0.016	0.015	1.089	0.276
		Friendliness		
Intercept	4.28	0.071	59.61	<0.001
Scar	0.047	0.015	3.181	0.001*
		Confidence		
Intercept	4.55	0.062	73.392	<0.001
Scar	-0.026	0.015	-1.772	0.077

SE, standard error

*Statistical analysis comparing attractiveness, friendliness, and confidence ratings based on the presence or absence of a facial scar were performed using Linear Mixed Effects Models with $p<0.05$ denoting significance.

Table 4. Interaction of Scars location Orientation and Subunit Placement on Attractiveness, Friendliness, and Confidence Ratings

Fixed Effects	β	SE	Z-Value	p
Attractiveness				
Intercept	4.3	0.083	51.324	<0.001
Mid	-0.018	0.020	-0.895	0.371
Forehead	0.038	0.020	1.915	0.056
Lower Lid	-0.027	0.020	-1.331	0.184
Upper lip	-0.011	0.020	-0.536	0.592
Perpendicular	-0.0063	0.035	-0.182	0.856
Forehead Mid	0.017	0.028	0.615	0.539
Lower Lid Mid	0.058	0.028	2.038	0.042*
Upper lip mid	-0.012	0.028	-0.418	0.676
Mid perpendicular	0.034	0.028	1.201	0.230
Forehead perpendicular	-0.024	0.040	-0.601	0.548
Lower Lid perpendicular	-0.065	0.028	-2.293	0.022*
Upper lip Perpendicular	0.019	0.028	0.686	0.493
Forehead mid perpendicular	-0.057	0.040	-1.414	0.157
Friendliness				
Intercept	4.2510	0.071	59.908	<0.001
Mid	-0.014	0.020	-0.672	0.502
Forehead	0.052	0.020	2.556	0.011*
Lower Lid	0.025	0.021	1.22	0.222
Upper lip	0.039	0.020	1.92	0.055
Perpendicular	-0.0031	0.035	-0.089	0.929
Forehead Mid	0.018	0.029	0.636	0.525
Lower Lid Mid	0.058	0.029	2.023	0.043*

Upper lip mid	-0.048	0.029	-1.657	0.098
Mid perpendicular	0.038	0.029	1.314	0.189
Forehead perpendicular	-0.014	0.041	-0.349	0.727
Lower Lid perpendicular	-0.094	0.029	-3.270	0.001*
Upper lip Perpendicular	0.0090	0.029	0.312	0.755
Forehead mid perpendicular	-0.064	0.041	-1.581	0.114
Confidence				
Intercept	4.518	0.062	72.794	<0.001
Mid	0.030	0.020	1.492	0.136
Forehead	0.041	0.020	2.062	0.039*
Under eye	-0.032	0.020	-1.576	0.115
Upper lip	0.019	0.020	0.958	0.338
Perpendicular	0.0061	0.035	0.175	0.861
Forehead Mid	-0.058	0.028	-2.04	0.041*
Lower Lid Mid	0.026	0.029	0.905	0.366
Upper lip mid	-0.069	0.028	-2.416	0.016*
Mid perpendicular	-0.021	0.028	-0.739	0.460
Forehead perpendicular	-0.028	0.040	-0.691	0.490
Lower Lid perpendicular	-0.072	0.028	-2.546	0.011*
Upper lip Perpendicualr	0.050	0.028	1.765	0.078
Forehead mid perpendicular	0.078	0.040	1.949	0.051

SE; standard error

*Statistical analysis comparing attractiveness, friendliness, and confidence ratings based on scar location (reference: cheek), orientation (reference: parallel), and subunit location (reference: border subunit) were performed using Linear Mixed Effects Models with $p<0.05$ denoting significance.

Figure 1

Figure 2

SDC 1