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Association of Face-lift Surgery With Social Perception, Age, Attractiveness, Health, and Success

Jason C. Nellis, MD, Masaru Ishii, MD, PhD, Ira D. Papel, MD, Theda C. Kontis, MD, Patrick J. Byrne, MD, MBA, Kofi D. O. Boahene, MD, Kristin L. Bater, BA, and Lisa E. Ishii, MD, MHS
Department of Otolaryngology–Head and Neck Surgery, Johns Hopkins University, Baltimore, Maryland

Abstract

IMPORTANCE—Evidence quantifying the influence of face-lift surgery on societal perceptions is lacking.

OBJECTIVE—To measure the association of face-lift surgery with observer-graded perceived age, attractiveness, success, and overall health.

DESIGN, SETTING, AND PARTICIPANTS—In a web-based survey, 526 casual observers naive to the purpose of the study viewed independent images of 13 unique female patient faces before or after face-lift surgery from January 1, 2016, through June 30, 2016. The Delphi method was used to select standardized patient images confirming appropriate patient candidacy and overall surgical effect. Observers estimated age and rated the attractiveness, perceived success, and perceived overall health for each patient image. Facial perception questions were answered on a visual analog scale from 0 to 100, with higher scores corresponding to more positive responses. To evaluate the accuracy of observer age estimation, the patients' preoperative estimated mean age was compared with the patients' actual mean age. A multivariate mixed-effects regression model was used to determine the effect of face-lift surgery. To further characterize the effect of face-lift surgery, estimated ordinal-rank change was calculated for each domain.

MAIN OUTCOMES AND MEASURES—Blinded casual observer ratings of patients estimated age, attractiveness, perceived success, and perceived overall health.

Corresponding Author: Lisa Ishii, MD, MSH, Department of Otolaryngology–Head and Neck Surgery, Johns Hopkins University, 601 N Caroline St, Baltimore, MD 21287 (learnes2@jhmi.edu).

Author Contributions: Dr Nellis had full access to all the data in the study and takes responsibility for the integrity of the data and the accuracy of the data analysis.

Study concept and design: Nellis, M. Ishii, Kontis, Byrne, Boahene, Bater, L. E. Ishii.

Acquisition, analysis, or interpretation of data: Nellis, M. Ishii, Papel, Byrne, L. E. Ishii.

Drafting of the manuscript: Nellis, M. Ishii, Boahene.

Critical revision of the manuscript for important intellectual content: Nellis, M. Ishii, Papel, Kontis, Byrne, Bater, L. E. Ishii.

Statistical analysis: Nellis, M. Ishii, Boahene, Bater, L. E. Ishii.

Administrative, technical, or material support: M. Ishii, Papel, Kontis, L. E. Ishii.

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RESULTS—A total of 483 observers (mean [SD] age, 29 [8.6] years; 382 women [79.4%]) successfully completed the survey. Comparing patients' preoperative estimated mean (SD) age (59.6 [9.0] years) and patients' actual mean (SD) age (58.4 [6.9] years) revealed no significant difference ($t_{2662} = -0.47$; 95% CI, -6.07 to 3.72 ; $P = .64$). On multivariate regression, patients after face-lift surgery were rated as significantly younger (coefficient, -3.69 ; 95% CI -4.15 to -3.23 ; $P < .001$), more attractive (coefficient, 8.21 ; 95% CI, 7.41 – 9.02 ; $P < .001$), more successful (coefficient, 5.82 ; 95% CI, 5.05 to 6.59 ; $P < .001$), and overall healthier (coefficient, 8.72 ; 95% CI, 7.88 – 9.56 ; $P < .001$). The ordinal rank changes for an average individual were -21 for perceived age, 21 for attractiveness, 16 for success, and 21 for overall health.

CONCLUSIONS AND RELEVANCE—In this study, observer perceptions of face-lift surgery were associated with views that patients appeared younger, more attractive, healthier, and more successful. These findings highlight observer perceptions of face-lift surgery that could positively influence social interactions.

LEVEL OF EVIDENCE—NA.

The number of cosmetic procedures in the United States continues to increase as evidenced by a 17% increase in cosmetic surgical procedures from 2011 to 2015.¹ Among the various cosmetic procedures, face-lift surgery remains one of the most common facial cosmetic operations performed.² Of note, increasing amounts of evidence suggest that facial appearances influence hiring decisions, with more attractive individuals perceived as having more positive attributes and occupational success.^{3,4} Thus, an improved facial appearance is assumed to enhance an individual's self-image and lead to benefits in social interaction.

A prior study⁵ found that patients report high satisfaction with their facial appearance, quality of life, and psychological well-being after face-lift surgery. In addition to understanding patient-reported outcomes, studies^{6,7} have found that face-lift surgery results in patients appearing younger and more attractive, with increased perceptions of femininity, likeability, and social skills. Although these studies^{5–7} suggest that facelift surgery improves social perceptions beyond youthfulness, there remains a lack of evidence quantifying the effect of face-lift surgery on perceived success and health. Understanding the multidimensional impact of face-lift surgery allows for better patient counseling regarding potential psychosocial outcomes. Furthermore, measuring the effect of facelift surgery allows physicians to more precisely guide patient expectations. The aim of the present study was to assess the perceptions of naive observers on perceived age, attractiveness, success, and health of patients following face-lift surgery. We hypothesized that patients after face-lift surgery will appear younger and more attractive, resulting in higher perceived health and success by others in society.

Methods

Participants

A total of 526 casual observers naive to the purpose of the study participated in the study from January 1, 2016, through June 30, 2016. Surveys were posted to multiple public access websites to recruit a random sample of casual observers from the general population. Survey distribution included posting to local community sites, student listservs, university

announcement sites, online discussion forums, and social media platforms. All individuals 18 years or older who spoke English were eligible. Electronic written informed consent was obtained from all study participants, and all data were deidentified. Participants were excluded if they were younger than 18 years or had schizophrenia, autism, or another affective psychiatric condition because these disorders alter facial perception.^{8,9} Participants who did not complete the entire survey were removed from the study. Observers were naive to the specific study objectives and assumed to be independent. The Johns Hopkins Institutional Review Board approved this study.

Instrument

Sixteen photographs of female patients were identified from image databases of faces of patients who had undergone facelift surgery by 1 of 5 facial plastic surgeons at an academic or private practice. Each facial plastic surgeon selected images that represented an optimal face-lift surgery outcome. Patients included had standardized preoperative and postoperative images and provided consent for the use of images. Preoperative and postoperative photographs were captured in a standardized fashion using similar technique, room, lighting, camera, and background (Figure 1). In addition, standardization was necessary to reduce the effects of potential confounders, such as image quality, head position, facial expression, and jewelry. All patients had postoperative images of least 6 months after surgery and had not undergone other cosmetic operations (eg, rhinoplasty or upper facial rejuvenation). The Delphi method, which involves the facial plastic surgery experts anonymously rating patient face-lift surgical outcomes, was used to select 13 standardized patients, confirming patient candidacy and overall surgical effect. This method verified that study patients represented an optimal effect from face-lift surgery while minimizing other patient confounders. The mean (SD) patient age was 58 (7) years. From the pool of 26 images (13 preoperative and 13 postoperative), 13 images were randomly and evenly inserted into surveys built using Qualtrics survey software (Qualtrics LLC). No survey contained more than 1 photograph of the same patient to limit the priming effect of presenting repeated measures. Observers were given introductory instructions on completing the survey and told that participants would view images of patients before or after surgery, but the surgical status of the patient images was not provided. In addition, surveys collected demographic data from observers, including observer age, sex, race, and highest level of education, and observers were asked whether they had undergone prior facial rejuvenation surgery or had known friends or family who had undergone facial rejuvenation surgery.

Naive observers were randomly presented 13 independent patient images and asked to estimate each patient's age and rate her attractiveness, perceived success, and perceived overall health. Observers were masked to the operative status of each patient image, and the order of image presentation was randomized using the Qualtrics survey software; however, observers were informed that some of the patients had undergone face-lift surgery. Facial perception questions were answered on a visual analog scale using a normalized slider bar with 1-point increments. Observers answered the question "What would you guess is this person's age?" using a slider bar ranging from 30 to 90 years of age in 1-year increments. Next, observers rated the attractiveness of the face from 0 (least attractive) to 100 (most attractive). Observers then answered the questions "How successful do you think this person

is?” on a scale of 0 (complete failure) to 100 (extremely successful) and “How healthy do you think this person appears?” from 0 (extremely unhealthy) to 100 (extremely healthy).

Study Objectives

The primary objective was to determine the effect of face-lift surgery on observer ratings of 4 domains, including estimated age, attractiveness, perceived success, and perceived overall health. A secondary objective was to determine whether estimated patient age was significantly different compared with the true patient age as measured by a collective group of casual observers.

Statistical Analysis

Data were analyzed using STATA SE software, version 13 (Stata-Corp). Multiple analytic techniques were used in this study, with the experiment-wide 2-sided significance level set at $P < .05$. Demographic characteristics of study observers were examined. Next, to evaluate the accuracy of observer age estimation, the patients’ preoperative estimated mean age was compared with the patients’ actual mean age using the 2-tailed t test. A multivariate mixed-effects regression model was used to determine the effect of face-lift surgery on the fixed effects, including observer perceived age, attractiveness, success, and overall health, while separating variances attributable to random effects caused by observer biases. This analysis technique is useful when accounting for individual observer bias when rating independent stimuli. Next, to further characterize effect size, ordinal rank change was estimated by scaling and integrating the normal distributions for each of the 4 measured domains using Mathematica statistical software, version 10.4 (Wolfram). The variance among study patients was used to calculate ordinal rank change in estimated age, and the variance among the observers was used to calculate ordinal rank change in perceived attractiveness, success, and overall health. The ordinal rank represents the rank position of an individual of 100 random individuals rank ordered from lowest to highest score for a specific domain. For our analysis, we calculated the change in ordinal rank of an average individual (ie, 50th rank position) of 100 individuals after face-lift surgery for each domain of interest.

Results

Of the 526 casual observers, 483 (mean [SD] age, 29 [8.6] years; range, 18–67 years) fully completed the web-based survey and were eligible for inclusion (Table 1). Most observers were white (364 [75.4%]), female (382 women [79.4%]), and educated with a 4-year college degree (289 [59.8%]). Most observers had not undergone prior facial rejuvenation surgery (464 [96.1%]) and did not know a friend or family member who had undergone facial rejuvenation surgery (295 [61.1%]).

Observer ratings of estimated age, attractiveness, perceived success, and perceived images are presented in Table 2. The results indicate that after face-lift surgery, patients had lower mean estimated age, improved mean attractiveness scores, higher mean perceived success scores, and higher mean perceived overall health scores. Next, we examined the accuracy of age estimation by a single casual observer. A single random individual would estimate a patient’s age within a mean of 6.9 years. However, the collective group of 483 casual

observers estimated patient age much more accurately as evidenced by no significant difference in hypothesis testing comparing patients' preoperative estimated mean (SD) age (59.6 [9.0] years) and patients' actual mean (SD) age (58.4 [6.9] years) ($t_{2662} = -0.47$; 95% CI, -6.07 to 3.72; $P = .64$). Thus, our sample population can estimate an individuals' age within months. Further analysis was performed to quantify the effect of facelift surgery across these 4 domains.

Prior literature^{10–12} has found positive associations between perceived youth and attractiveness. Furthermore, attractiveness is reportedly associated with perceived health.¹³ With attention to these findings, a multivariate mixed-effects regression model is presented in Table 3 that indicates the effect of face-lift surgery on estimated age, attractiveness scores, perceived success scores, and perceived overall health scores while accounting for the random effects of observer bias. Patients after face-lift surgery were rated by casual observers as significantly younger (constant, 59.36 years; 95% CI, 59.09–59.98; coefficient, -3.69; 95% CI, -4.15 to -3.23; $P < .001$), more attractive (constant, 48.89; 95% CI, 47.94–49.83; coefficient, 8.21, 95% CI, 7.41–9.02; $P < .001$), more successful (constant, 57.45; 95% CI, 56.67–58.22; coefficient, 5.82; 95% CI, 5.05–6.59; $P < .001$), and overall healthier (constant, 54.86; 95% CI, 54.03–55.68; coefficient, 8.72; 95% CI, 7.88–9.56; $P < .001$).

In Figure 2, we present the estimated ordinal rank change as a measure of the effect size of face-lift surgery in the domains of estimated age, attractiveness, perceived success, and perceived overall health. In a group of 100 random individuals rank ordered from lowest to highest, an average patient (ie, position 50) undergoing face-lift surgery would expect to shift their rank to appear younger to an additional 21 individuals compared with before surgery. In addition, an average patient undergoing face-lift surgery would shift the patient's rank to be 21 individuals more attractive (ie, position 71), 16 individuals more successful (ie, position 66), and 21 individuals healthier (ie, position 71).

Discussion

In this study, casual observers blinded to patient operative status rated independent images of patients after face-lift surgery as significantly younger, more attractive, more successful, and overall healthier. To the best of our knowledge, this is the largest study of its kind. The findings of this study suggest that face-lift surgery significantly improves a patient's appearance across several domains. Thus, patients can expect to appear more youthful and may derive additional benefits when engaging in social interactions.

To understand the effect of face-lift surgery on social perceptions, our study relied on the principle termed *vox populi*. As described by Sir Francis Galton, a corpus of literature across various disciplines has shown that when seeking to answer a question, the mean estimated value from a large group of individuals provides a value that closely approximates the true value proving more accurate than an individual's or even an expert's opinion.^{14–18} Our study further supports this theory because the patients' mean observer estimated age was not significantly different from the actual mean patients' age. This finding further strengthens our confidence that the study cohort's collective ratings quantifying the effect of face-lift surgery closely approximates the true effect of face-lift surgery as perceived by society.

Patients often seek face-lift surgery because they want to reverse the consequences of time on the aging face, and preoperatively they desire an estimate of effect. Various studies^{7,19} have examined the effect of face-lift surgery on perceived age. However, few studies have specifically quantified the effect of face-lift surgery on estimated age. In a single-surgeon study of 40 observers, Chauhan et al¹⁹ found a mean difference of 5.7 years younger when comparing perceived age before and after face-lift surgery. A larger study⁷ of 198 observers found a 4.7-year mean reduction in perceived patient age after facelift surgery. Similarly, our results found that patients appeared significantly younger after face-lift surgery. Regression quantified the effect of face-lift surgery while accounting for the random effects attributable to observer bias (Table 3). In addition, we present another measure of effect size by estimating rank change on perceived age. In a random group of 100 casual observers, the perceived age of an average patient after face-lift surgery would shift to look younger to an additional 21 casual observers compared with before surgery. This finding suggests that patients will appear younger than their stated age to more individuals when engaging in social interactions. However, the effect size in our study may be less than what patients anticipate when seeking face-lift surgery. Thus, our findings may serve as a useful reference for the facial plastic surgeon discussing patient expectations regarding the potential for facial rejuvenation resulting from face-lift surgery.

Although the pursuit of youth is an important motivation for surgery, patients also desire to improve their attractiveness and consequently their self-image.^{20–22} Few studies^{6,23} have examined the effect of face-lift surgery on attractiveness. In a study of 50 masked raters, Zimm et al²³ noted a small, nonsignificant increase in attractiveness after face-lift surgery, with those authors recognizing the study was limited by the rating scale and the small sample size. In contrast, Reilly et al⁶ found a significant improvement in attractiveness from face-lift surgery when comparing preoperative and postoperative observer-rated scores. Congruently, our results demonstrated a significant improvement in attractiveness. The average patient after face-lift surgery would expect to shift rank 21 positions higher in attractiveness in a group of 100 random individuals. Consistent with a prior study²⁴ that reported an inverse association between perceived age and facial attractiveness, the improvement in attractiveness is likely related to patients appearing more youthful after face-lift surgery. These results have significant implications because improving one's attractiveness has substantial social benefits.

Prior studies^{13,25,26} have demonstrated that attractive individuals gain perceptual advantages when interacting in society. Rhodes²⁶ considers an attractive face as a manifestation of “good genes,” indicating an evolutionary adaptation for improving mate selection. Furthermore, a healthy facial appearance contributes to increasing perceptions of attractive traits by observers.¹³ These findings support the improvement in perceived attractiveness and perceived health after face-lift surgery found by our study. Consequently, patients undergoing face-lift surgery may be viewed in society as a higher-quality mate.

Beyond health, individuals considered more attractive experience what is often described as a halo effect. Dion et al⁴ found that attractive individuals are assumed to possess more socially desirable personalities, live happier lives, and experience more success compared with less attractive individuals. Furthermore, individuals perceived as more attractive are

more likely to be hired for a job, receive judicial leniency, and be elected as political candidates.^{3,27,28} Our results reveal that patients after face-lift surgery have improved attractiveness and perceived success. Although preliminary, these findings suggest that the overall effect of face-lift surgery has the potential to improve perceptions across many aspects in social interaction with a conceivable effect on occupational outcomes.

Limitations

Our study has several limitations. First, the survey instrument included only female patients. Although men were not included in the study, prior national data have reported that approximately 83% to 89% of face-lift operations are performed on women.^{1,2} Second, the survey included 13 patients selected using the Delphi method to ensure ideal patient candidacy and overall surgical effect. Thus, these results do not reflect the broad range of face-lift surgical outcomes, which depend on various patient factors, surgical technique, and, more important, surgeon experience. Thus, our inferences are limited in that they can solely reflect the optimal female patient outcome. Third, with regard to our participant population, a large proportion of our observers are young, educated, white women, which likely is a consequence of distributing a web-based survey. Despite our participant population not reflecting the general US population, we aggregated a large sample allowing for the use of the vox populi principle supported by the accuracy of age estimation by our collective observers. Thus, we are reassured that the large group's estimate closely approximates the true value for each domain. However, the participant demographic characteristics limit our ability to extrapolate the effect of face-lift surgery on overall social interactions. In addition, Kuraguchi et al¹² found that ratings of attractiveness are not significantly different between the sexes. Furthermore, the variance in our observer ratings was large for each domain, likely resulting from a large range of individual observer biases and the numerous factors that influence perceived age, attractiveness, health, and success, which significantly varies among observers. Finally, our survey could not measure all the factors that influence the 4 domains of interest. In our analysis, we can account for them in the residual variances of the regression model.

Nonetheless, these data demonstrate that after face-lift surgery patients are perceived as measurably younger, more attractive, more successful, and overall healthier. To better understand the effect of face-lift surgery, future investigations should include a range of postoperative outcomes to provide a more comprehensive measurement of the average facelift's surgical outcome. Furthermore, studies identifying predictors of face-lift success may better guide patient selection to optimize patient outcomes. In addition, future studies may examine the effect of face-lift surgery on other domains of social interactions, such as willingness to communicate or affect display. With the goal of improving physician-patient discussions regarding the effect of face-lift surgery, this study offers quantitative data in a meaningful format that may prove to be helpful in guiding patient expectations.

Conclusions

In this study, face-lift surgery was associated with patients appearing significantly younger, more attractive, more successful, and overall healthier. These findings highlight the

multidimensional positive association of face-lift surgery with implications regarding social perceptions beyond restoring a youthful appearance.

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Key Points

Question

What is the effect of face-lift surgery on social perceptions of age, attractiveness, health, and success?

Findings

In this survey of 483 blinded, naive observers rating independent patient images, face-lift surgery was associated with patients appearing younger, more attractive, healthier, and more successful.

Meaning

These findings highlight the multidimensional positive association of face-lift surgery and implications regarding social perceptions beyond restoring a youthful appearance.

Figure 1. Sample Image of a Patient Before (Left) and After (Right) Face-lift Surgery
Survey blocks presented a preoperative or postoperative image independently.

Figure 2.
Estimated Ordinal Rank Change for Perceived Age, Attractiveness, Success, and Overall Health

Table 1

Demographic Characteristics of Study Observers^a

Characteristic	Finding (N = 483)
Age, mean (SD), y	29 (8.6)
Sex	
Male	99 (20.6)
Female	382 (79.4)
Did not specify	2 (0.4)
Race	
White	364 (75.4)
Asian	68 (14.1)
Hispanic	23 (4.8)
African American	12 (2.5)
Other	16 (3.3)
Educational status	
Less than high school	0
High school or GED	7 (1.4)
Some college	22 (4.6)
2-y college degree	13 (2.7)
4-y college degree	289 (59.8)
Master's degree	97 (20.1)
Doctoral degree	54 (11.2)
Prior facial rejuvenation surgery	
No	464 (96.1)
Yes	17 (3.5)
Did not specify	2 (0.4)
Friends or family with facial rejuvenation surgery	
No	295 (61.1)
Yes	186 (38.5)
Did not specify	2 (0.4)

Abbreviation: GED, general educational development.

^aData are presented as number (percentage) of observers unless otherwise indicated.

Table 2

Observer Ratings of Patients Before and After Face-lift Surgery

Domain	Mean (SD)	
	Before	After
Estimated age ^a	59.60 (9.00)	55.85 (9.23)
Attractiveness ^b	48.82 (18.25)	57.10 (16.83)
Perceived success ^b	57.48 (16.58)	63.38 (15.04)
Perceived overall health ^b	54.88 (18.26)	63.75 (16.15)

^aRated using a slider bar from 30 to 90 years in 1-year increments.

^bRated using a slider bar from 0 to 100 in 1-point increments, with higher scores corresponding to more positive responses.

Table 3

Multivariate Mixed-Effects Model for the Effect of Face-lift Surgery

Variable	SE	Coefficient ^a (95% CI)	P Value
Fixed Effects			
Estimated age ^b			
Face-lift surgery ^c	0.24	−3.69 (−4.15 to −3.23)	<.001
Constant	0.23	59.54 (59.09 to 59.98)	<.001
Attractiveness ^d			
Face-lift surgery ^c	20.03	8.21 (7.41 to 9.02)	<.001
Constant	0.48	48.89 (47.94 to 49.83)	<.001
Success ^d			
Face-lift surgery ^c	0.39	5.82 (5.05 to 6.59)	<.001
Constant	0.39	57.45 (56.67 to 58.22)	<.001
Overall health ^d			
Face-lift surgery ^c	0.43	8.72 (7.88 to 9.56)	<.001
Constant	0.42	54.86 (54.03 to 55.68)	<.001
Random Effects			
Variance			
Observer (age), facial paralysis	1.15	10.69 (8.67 to 13.19)	NA
Residual (age), facial paralysis	1.47	72.43 (69.60 to 75.38)	NA
Observer (attractiveness), female	5.63	65.95 (55.78 to 77.96)	NA
Residual (attractiveness), female	4.69	219.89 (210.89 to 229.27)	NA
Observer (success), facial paralysis	3.49	34.52 (28.32 to 42.09)	NA
Residual (success), facial paralysis	4.32	199.75 (191.46 to 208.39)	NA
Observer (health), female	3.79	36.59 (29.87 to 44.82)	NA
Residual (health), female	5.19	240.42 (230.47 to 250.81)	NA
Covariance, residual			
Age, attractiveness	1.84	−7.06 (−10.66 to −3.45)	<.001
Age, success	1.77	−13.59 (−17.05 to −10.13)	<.001
Age, health	1.93	−13.67 (−17.46 to −9.88)	<.001
Attractiveness, success	3.74	126.21 (118.87 to 133.54)	<.001
Attractiveness, health	4.17	146.72 (138.56 to 154.89)	<.001
Success, health	4.10	150.31 (142.28 to 158.34)	<.001

Abbreviation: NA, not applicable.

^a Coefficients for fixed effects and estimate for random effects.

^b Estimated age was coded on a visual analog scale of 30 to 90 years.

^c Face-lift surgery was coded as 0, indicating before face-lift surgery, or 1, indicating after face-lift surgery

^d Attractiveness, perceived success, and perceived overall health were coded on a scale of 0 to 100, with higher scores corresponding to more positive responses.

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