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CITATION: Nuyen, B.A., Kandathil, C.K., Saltychev, M., Firmin, F., Most, S.P. and Truong, M.T. (2021), The Social Perception of Microtia and Auricular Reconstruction. *The Laryngoscope*, 131: 195-200.
<https://doi.org/10.1002/lary.28619>

which has been published in final form at

DOI

<https://doi.org/10.1002/lary.28619>

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The Social Perception of Microtia and Auricular Reconstruction

Short Running Title: Microtia and Social Perception

Type of Study: Original Investigation

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Financial Disclosure Statement: The authors have nothing to disclose.

Conflict of interest: None to declare

Meeting Presentation: This work was presented at the 2019 American Academy of Facial Plastic and Reconstructive Surgery Annual Meeting in San Diego.

Financial Disclosures and Products:

This work was supported by Stanford Medicine and Stanford Department of Otolaryngology-Head and Neck Surgery funding.

Consents and Permissions: Per *Laryngoscope* Editorial Office, permissions are not required for Figure 1.

Abstract

Objectives/Hypothesis: To examine the social perception of microtia and quantify the effect of reconstruction on socially-perceived attributes.

Methods: A patient volunteer with unilateral Grade III microtia and associated peri-reconstruction photographs without underlying craniofacial syndromes was consented. With computer simulation, the normal, preoperative microtia, and postoperative reconstruction ear were isolated and blended into the oblique and lateral views of that volunteer's face to isolate ear morphology as a variable against a constant facial baseline. These photographs were embedded into web-based surveys with visual analogue scales to capture social perception data and then sourced to general population adults.

Results: Survey respondents totaled 631. On average, the face with the "microtia" ear was perceived to be less friendly ($p = 0.015$), less healthy ($p = 0.022$), less successful ($p = 0.005$) than the same face with the "normal" ear. There were no statistically-significant differences in socially-perceived attributes between the face with the Normal ear and that with the Reconstructed ear.

Conclusions: This is the first study to examine the social perception consequences of microtia and microtia reconstruction in children. These findings may explain the significant psychosocial distress experienced by these patients by exploring the social perception of specific attributes perceived. Lastly, this study may better inform microtia patients and their physicians on the impact of auricular reconstruction on third-party's perception of social attributes.

KEYWORDS: Microtia, social perception, auricular reconstruction, external ear

LEVEL OF EVIDENCE: N/A

Introduction

Like other visible facial deformities, microtia carries associated patient-reported psychosocial burden¹⁻⁶. Multiple studies have documented reduced self-confidence affecting social interactions, teasing, dissatisfaction with appearance as prevalent motivating factors to pursue reconstruction^{3,6}. Ear reconstruction has been demonstrated to significantly improve psychosocial functioning among patients^{3,4}.

While such significant patient-reported burdens have been widely examined, investigation of the impact of third-party perception on microtia and ear reconstruction has been scarce. It is not yet been demonstrated if and how the general public perceives social qualities inferred from microtia dysmorphology, and how ear reconstruction affects such perception.

Third-party perception has been already widely utilized as a measurement of outcomes for facial plastic and reconstructive surgeries in general. Specifically, web-based methods to capture public perception have been previously employed, e.g. to investigate the effect of facial paralysis⁷ on perception of social attributes. Prior studies from our research group have used the web-based surveys to document the effects of nasal dorsal contour manipulation on social perception^{8,9}. However, no prior studies have captured how the general public perceives microtia and whether the reconstruction thereof affects that perception.

In this study, we used a web-based platform to capture how microtia and the reconstruction thereof affects the general public perception of athleticism, confidence, friendliness, health, intelligence, leadership, popularity, and overall success.

Material and Methods

Recruitment for a patient volunteer with isolated unilateral Grade III microtia without any other craniofacial syndromes for the index photograph was conducted at the Craniofacial clinics of two different institutions. All patient volunteers in consideration had autologous rib reconstruction. Four male patients and four female patients and their legal guardians provided written informed consent for their preoperative and postoperative photographs on oblique and lateral view to be used for research and publication purposes. The oblique and lateral views were chosen for its descriptive capture of the external ear subunits. Using the Delphi method, 3 authors (S.P.M, B.N., and M.T.T) selected 1 volunteer's preoperative and postoperative photographs of the eight.

The 2017 version of Adobe Photoshop, Adobe Systems Inc was used for computer simulation. The patient volunteer's photographs were gray-scaled to reduce the effect of color texture variation on social perception¹⁰. The volunteer's face with the contralateral, normal left ear taken at a post-reconstruction office visit was rotated horizontally and used to represent the control face (coded: Normal). To generate the set of facial photographs with the patient's right microtic ear, the patient's preoperative microtic ear on oblique and lateral views was isolated and used to replace the patient's control ear for oblique and lateral views, respectively (coded: Microtia). The same technique was used to isolate the patient's reconstructed ear and replace the patient's normal ear (coded:

Reconstructed). Thus three different sets of photographic panels were generated: patient volunteer's microtic ear, normal ear, and reconstructed ear with his baseline facial features in oblique and lateral view (Figure 1). Oblique and lateral views were chosen for the detailed exposition of ear aesthetic subunit anatomy; front and rear views were excluded in this study per survey platform layout and design standards for photographic quality. All ears were right-sided to reflect the higher prevalence of right-sided microtia¹¹.

Utilizing the Qualtrics survey software (Qualtrics LLC) platform, three different surveys were created, one survey for each photographic condition (Normal, Microtia, Reconstructed). Each survey consisted of the same eight questions asking the surveyee to rate the athleticism, confidence, friendliness, health, intelligence, leadership, popularity, and overall success of the child in the photograph along a visual analogue scale (Figure 2). The visual analogue scale has been used as a quantitative tool in prior social perception research within facial plastic and reconstructive surgical literature^{8,9,12,13}. Each survey was then distributed to a requested, nonrepeated sample size of 200 participants from within the Qualtrics survey corporation's participant database (≥ 18 years). The participants were unaware of the purpose of the study, did not take the survey more than once or any other surveys from this study, and were reimbursed for responses.

The study was approved by the Stanford University institutional review board. The age of respondents was defined in full years at the time of survey. Ethnicity was defined as White/ Caucasian, Black/Afro-American, Hispanic/Latino, Asian, or other. Educational level was dichotomized as high school vs. no high school. Annual income was graded as

< \$25,000, \$25,000-\$50,000, \$50,000-\$75,000, \$75,000-\$100,000, \$100,000-\$125,000, \$125,000-\$150,000, and >\$150,000. Being parent or guardian, knowing personally any children with congenital facial deformities, and having any of friends or family who underwent any plastic or reconstructive surgery were dichotomized as yes vs. no.

Statistical analysis

The results were reported as means and standard deviations (SDs) or with absolute n-numbers and percentage. Analysis of variance (one-way ANOVA) was used to compare the mean age of three groups. Categorical variables were compared by employing a Chi square test. To compare responds obtained at different photos, the Dunnett's pairwise comparisons of means was employed. Multiple regression analysis was used to predict the value of the responses based on the value of the respondents' characteristics and three images. The results were judged by a p -value and a coefficient of determination (R^2). A two-tailed p -value ≤ 0.05 was considered significant. All the analyses were carried out using Stata/IC Statistical Software: Release 15. College Station (StataCorp LP, TX, USA).

Results

Table 1 describes the 631 participants that completed the surveys; 210 participants completed the survey featuring the photographs of the boy with the Normal ear, 210 participants completed the survey featuring the photographs of the boy with Microtia ear, and 211 participants completed the survey featuring the photographs of the boy with the Reconstructed ear. There was an overall 100% completed survey return rate by Qualtrics LLC, with additional 10-11 participants provided by Qualtrics LLC per survey.

Respondents' average age was 39.1 years (standard deviation 14.3). Most participants identified as white (414 [66%]), most completed high school (601 [95%]), most did not personally know children with facial deformities (508 [81%]), and majority had no personal or family/friend history of prior plastic/reconstructive surgery (464 [74%]). 312 participants identified as women (51%), and 350 described themselves as a parent or guardian (55%). There were no sociodemographic variables that differed significantly among each of the survey cohorts.

Table 2 describes the participants' visual analogue scale ratings of the photographs of the boy with the Normal ear ("Normal"), of the boy with the Microtia ear ("Microtia"), and of the boy with the Reconstructed ear ("Reconstructed"). The statistically-significant differences in social attribute ratings are highlighted. On average, "Microtia" was perceived to be less friendly ($p = 0.015$), less healthy ($p = 0.022$), less successful ($p = 0.005$) than "Normal." Additionally, on average, "Microtia" was perceived to be less healthy ($p = 0.019$) and less intelligent ($p = 0.021$) than "Reconstructed." There were no statistically-significant differences in socially-perceived attributes on average between "Normal" and "Reconstructed."

Multiple regression analysis showed certain statistically significant dependencies of ratings on the demographic characteristics of the respondents. However, all the coefficients of determination (R^2) ranged from 0.01 to 0.04; in other words, 1% to 4% of the variability on ratings were defined by the raters' demography.

Discussion

This is the first study to our knowledge that documents how microtia and the reconstruction thereof affects the general public perception of a variety of social attributes. Specifically, in our large cohort of adult observers viewing our patient volunteer's ear photographs, microtia was associated with the perception of decreased friendliness, health, and success compared to a normal ear. Additionally, there were no significant differences in rated attributes between the patient volunteer's normal ear photograph and reconstructed ear photography.

Our study's results add to current understanding of the general public perception of microtia. Byun et al. surveyed a prospective random general population sample of 124 adults to generate objective health state utility scores for microtia¹⁴. These authors compared their calculated perceived burden of disease represented by the facial aesthetic stigma of microtia without deafness to other previously-published disease states. The perceived aesthetic burden of microtia without deafness by general adults was found to be similar to that of the deformity after primary rhinoplasty¹⁵, but significantly less burdensome compared to cleft lip and palate¹⁶. However, Byun et al. found that microtia with deafness was not different from monocular blindness in terms of disease burden. The data described in our array of attributes explored in this study further clarify these objective health utility scores. Our study affirmed the decreased healthiness microtia patients are perceived to experience as compared to their "normal" counterparts. Additionally, the measured social burden of decreased perceived friendliness and success

further describe the perceived social profile of the microtia patient. This critically adds to the discussion of perioperative values and motivations.

Although a causal etiology cannot be determined in this cross-sectional evaluation, this study opens a discussion on the relationship between third-party perception and microtia patient experiences and outcomes. Depression, hostility, and social withdrawal are common among microtia patients³⁻⁶, with experiences of being teased, poor self-esteem, dissatisfaction with appearance as known predominant motivators for seeking reconstructive surgery³. Our study's specific findings of decreased perceived friendliness, health, and success quantified certain social penalties that may be related to the microtia patients' experienced psychosocial dysfunction. Moreover, the lack of difference in perceived social attributes between the normal ear and reconstructed ear perhaps suggests that the social profile of a patient of a microtia patient after auricular reconstruction may not differ from that of a peer without microtia. This correlates with the known patient-reported outcomes of post-operative improvement in social functioning from a preoperative dysfunctional baseline^{3,4}.

Limitations of this study are inherent to study design and population. The conclusions drawn may only be generalizable to microtia patients who have similar characteristics as those of our patient volunteer's photographs, i.e. same ethnic features, age appearance, gender expression, microtia type, reconstruction method. Additionally, patients with post-reconstruction outcomes that aesthetically differ from that of our study's volunteer may likely have social perception profiles that differ from our results. Faithful auricular

reconstruction as seen in our study volunteer appears to be associated with perceptions indistinguishable from that of an unaffected ear – likely resulting in patients’ psychosocial experiences not dissimilar to those of their “normal” counterparts. While study authors do not discuss technique here nor posit to test perception of the host of ranges of surgical outcomes, the importance of quality of reconstruction is an opportunity for further perception-related research. Future controlled studies investigating the effect of these covariates on the perception of social attribute are needed. Additionally, this study did not examine how child observers perceived their peer pediatric microtia patients, nor how adult observers perceived adult microtia patients.

Strengths of this study include the large cohort surveyed, among the largest of prior facial analysis and social perception studies focused on congenital deformities. Use of a web-based platform facilitated this statistical power – a strategy applied in previous studies^{8,9}. Furthermore, using computer simulation and a controlled baseline set of constant facial features, expression, skin texture, grooming, lighting, and head tilt allowed us carefully isolate the effect of ear morphology on social perception. This avoids the variability that may be inevitable with using actual preoperative and postoperative photographs of microtia patients, who naturally age and mature and otherwise may change through the staged perioperative process.

Conclusion:

Microtia appears to be associated with significant penalties in perception of social attributes, namely decreased friendliness, decreased health and decreased success. There

are no apparent differences in socially-perceived attributes between the normal ear and the ear after auricular reconstruction in this study. These findings may explain the significant psychosocial distress experienced by these patients. Lastly, this study may better inform microtia patients and their physicians on the impact of auricular reconstruction on third-party's perception of social attributes.

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[Figure 1]

Figure 1. Computer-simulated photographs merging patient volunteer's baseline facial characteristics with his microtia ear, contralateral normal ear, and postoperative reconstructed ear, cropped for patient privacy.

[Figure 2]

Figure 2. Visual analogue scales asking participants to rate social attributes of the photograph provided.

[Table 1]

Table 1. Sociodemographic characteristics of our surveyed participants.

[Table 2]

Table 2. Visual analogue scale ratings of social characteristics by image (statistically-significant values bolded).