

The effects of computer simulated facial plastic surgery on social perception by others

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Previous studies have demonstrated the remarkable impact of facial plastic surgery on the perception of facial features. However, pre- and postoperative differences other than the surgically changed features such as facial expression, hairstyle, make-up etc., have influenced the results of previous studies. To exclude these visual cues a computer composite photograph of the changed feature mounted upon the preoperative photograph, instead of the Standard postoperative photograph, was presented to observers in this study. Computer graphic technology was used to superimpose the postoperative, surgically changed facial features such as the nose, ear and chin of 16 patients on standardized preoperative photographs. The randomized preoperative photographs and the 'postoperative' composed images were presented to 67 subjects, using a person-perception questionnaire. Multivariate analysis demonstrated a more favourable postoperative judgement in only two patients (12.5%). The exclusive effect of facial plastic surgery on the social perception of patients by others when excluding visual cues, such as facial expression, hairstyle, make-up etc, is limited. It is tentatively assumed that the role played by facial plastic surgery is one of initiating a positive cycle by changing the patient's self-perception rather than one of direct social impact from the changed features.

Keywords *facial plastic surgery psychosocial effects computer graphics*

Improving the patient's psychosocial well-being is the ultimate goal of facial plastic surgery. Initially, surgeons were mainly concerned with the technical aspects of various procedures. However, over the last two decades, facial plastic surgery is increasingly appreciated for its psychosocial merits, resulting in a growing number of studies performed both by surgeons and psychiatrists.

The great majority of patients who have undergone facial plastic surgery report satisfaction with the result.¹ However, the reasons for this success remain a subject of debate. The vast majority of studies in this respect are concerned with the psychological characteristics of the patients and the psychological changes after surgery.²⁻³ Explanations and mechanisms suggested for the well-established psychological effects are often vague. Most researchers stress the importance of beauty for the self-image of the patient⁴ and focus on Freudian sym-

bolic meanings of actions and events related to surgery.⁵ Lynn and Goldman⁶ and Goin and Goin³ suggested that self-conscious preoccupations about a facial physical feature may deplete psychological energy, which may be reharnessed after treatment and made available for the better management of daily life.

Studies on the impact of aesthetic surgery on the social world of the patient is little understood. Few have documented this specific effect.⁷⁻¹⁰ Both the improved facial features and changes in the patient's state of mind may have an impact on the patient's social world. The loss of self-consciousness after surgery may lead to greater confidence, reflected in easier and increasingly warmer and open interactions with others. Subsequently, other people see the anatomical and psychological changes after surgery and provide positive verbal and non-verbal feedback, which adds strength to the patient's growing self-esteem in what Marcus¹¹ has called a domino effect.

In assessing the value of improved facial features, psycho-

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logical as well as social issues need to be taken into account. From a psychosocial perspective, two questions may be asked: does physical attractiveness indeed influence the social perception of others and has the effect of facial plastic surgery in this respect been documented?

In the last two decades an increasing number of studies on physical attractiveness have appeared in the literature with implications for the social effect of facial plastic surgery. For example, Berscheid *et al.*¹² have shown that men and women show substantial agreement as to what is beautiful and what is not. Even young children reliably discriminate differences in facial attractiveness.¹³ Berscheid and Walster¹⁴ found that most adults possess very definite sociocultural stereotypes as to what beautiful people are like. In addition, an extensive literature demonstrates that unattractive individuals are perceived more negatively than their attractive peers on a broad scale of traits, behaviour and skills.¹⁵⁻¹⁷ This is in accordance with what folk psychology tells us: 'What is beautiful is good'. This prejudice, based on first impressions, may or may not have an effect on social participation. A great many studies demonstrate that attractive persons, regardless of their sex, are preferred to the unattractive as dating partners.¹⁸ However, only a small body of evidence suggests a positive influence of physical attractiveness in long-term social interaction. Reis *et al.*¹⁹ have shown that attractiveness related positively to the quantity of social interaction for men and the affective quality of social experience for both sexes. On the other hand, no consistent relationship between facial appearance and marital adjustment or between academic performance and beauty has been established.²⁰ These data, then, do suggest that neither facial deformity nor beauty have uniform effects on self-concept and function. External appearance, although an important factor, is only one variable in a complex array of variables involved in developing satisfying social relationships. It seems reasonable that appearance should influence our judgement less and less as we become more acquainted with a person. However, some perceptual effects may linger even as social distance decreases.²¹ Furthermore, an unattractive individual may never have the opportunity to disprove initial unfavourable impressions. Thus, the role of beauty in first impressions remains important.

One of the first studies on the social effect of facial plastic surgery was done by Kurtzberg *et al.*¹ Prison inmates with surgically corrected facial disfigurements showed improved psychological adjustment and subsequently less prison recidivism as opposed to a non-surgical group.

Three other studies have specifically documented the effect of aesthetic surgery on the social perception of patients by others, basically using the same research method.⁸⁻¹⁰ Kalick conducted a pioneering experiment in which subjects viewed either preoperative or postoperative lateral photographs of female patients.⁸ Cash *et al.*⁹ provided a methodologically improved and extended replication of Kalick's work. Both

studies demonstrated reliable differences in one or more perceived psychosocial attributes occurring in a large percentage of patients. In Dutch patients with a wide variety of facial features corrected, Vuyk *et al.*¹⁰ assessed possible cultural influences, obtaining similar results. Thus support was raised for a comparable cross-cultural mechanism.

Using photographs when judging people on first impressions, as in these three experiments, is proclaimed valuable by Hakman.²² Here, the judging of photographs of randomly chosen persons provided consistent and valid assessments over a large group of subjects, although previous research has indicated that the use of photographs rather than actual individuals in studies of interpersonal attraction may in fact understate the importance of changes in physical attractiveness.²³ However, in spite of rigorous patient selection subtle pre- and postoperative differences, other than the surgically induced changes such as hairstyle, make-up and, possibly more important, facial expression, are inevitable.¹⁰ This present study was designed to investigate exclusively the effect of facial plastic surgery on the social perception of patients by others. Therefore, a replica was conducted of Vuyk *et al.*'s preceding experiment¹⁰ maintaining the same stimulus persons, number and sex-ratio of subjects, and procedure and statistical processing, but replacing photographs by digital prints. This was accomplished by superimposing the postoperative, surgically changed features (nose, ear, chin) on the preoperative photograph using computer graphic technology.

Materials and methods

STIMULUS MATERIALS

Patients were selected from a Dutch private practice of one of the authors (H.D.V.). The particular practice population seldom manifests massive distortions or strong stigmatization. The magnitude of the aesthetic change between preoperative and postoperative condition was not a criterion for inclusion in the study (Figures 1 and 2).

The same 15 patients¹⁰ together with one additional female otoplasty patient were included in this experiment. The age of the 16 patients (eight male, eight female) ranged from 11 to 54 years. All had undergone technically successful surgery with a minimal follow-up of 4 months. The surgical corrections involved various facial features or combinations (Table 1).

Standardized pre- and postoperative colour photographs both lateral and frontal had been taken.

The preoperative photographs and surgically corrected features of postoperative photographs were digitized using an Afga Arcus⁺ scanner with a resolution of 200 lines/in. Applying Fotoshop Adobe running on a Powermac (Apple), the preoperative photographs were retouched using the surgically corrected features. A Seiko Colorpoint S2 created RGB-colour, 20 x 30 cm prints of both preoperative images and

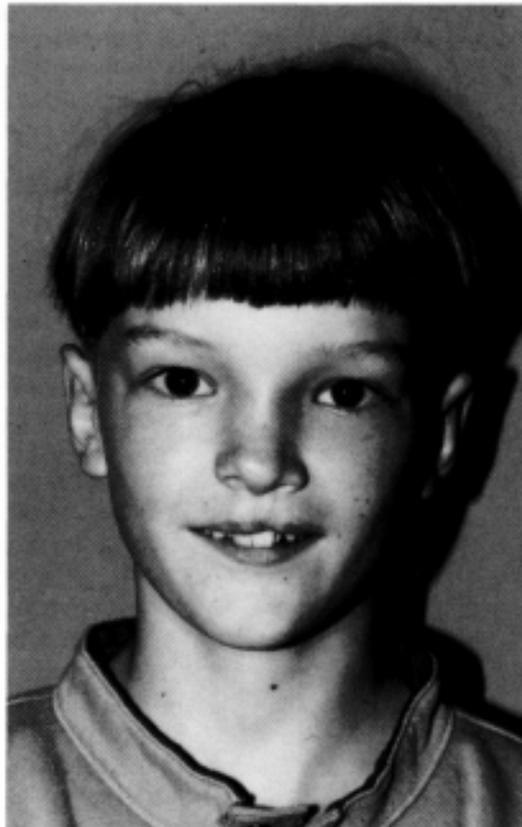
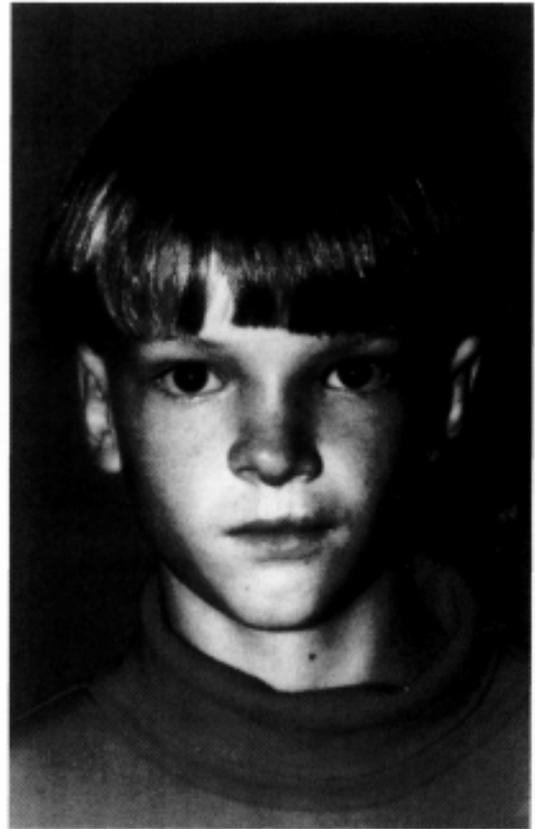


Figure 1. (a) Preoperative (b) manipulated postoperative and (c) 2-year postoperative A.P. photographs of a young male otoplasty patient. The postoperative picture was rated significantly more positively from a psychosocial perspective than the preoperative picture.



Figure 2. (a) Preoperative (b) simulated postoperative and (c) 1-year postoperative A.P. photograph of female rhinoplasty patient. No psychosocial difference was noted between the preoperative picture and the postoperative simulated picture.

Table 1. The 16 patients divided according to surgical procedure and sex

Procedure	Additional procedure	Male	Female	Total
Rhinoplasty	None	5	4	9
Rhinoplasty	Mentoplasty	1	1	2
Rhinoplasty	Excision of benign facial lesions	0	1	1
Rhinoplasty	Otoplasty	1	0	1
Otoplasty	None	1	2	3
Total		8	8	16

'postoperative' composite images. Apart from the corrected features, those prints were identical. However, the digital prints happened to be slightly toned down when compared with the original photographs.

SUBJECTS, MEASURES AND PROCEDURE

The subjects were 36 men and 40 women ranging in age from 14 to 82 years (mean 35). The 76 participants were told that the experimenter was interested in how accurately people are able to make judgements of personality by looking at photographs of persons who might or might not have had some kind of facial operation. The subjects were neither told that the patients were facial plastic surgery patients nor that they were seeing digital images. The pre- and postoperative digital prints for each patient were randomly assigned to two different sets so that each set contained only one image per patient. Half of each set consisted of preoperative digital prints and half of postoperative digital prints. Thus, the observer saw either pre- or postoperative pictures, but never both of the same person. Subjects were randomly assigned to one of the two sets of prints. For the purpose of procedural and stimulus adaptation and to rule out possible acquaintancy, subjects viewed all the prints once before beginning their rating task. It was stressed that it was important for the subject to rate the images frankly and intuitively. The latter was enhanced by asking the subjects to complete the ratings for each person depicted within 2.5 min.

The subject's ratings were made on 10-point scales, the ends of which were labelled by polar opposites of 20 different personality traits (person-perception questionnaire; Table 2). For further statistical study of the data, these 20 variables can be clustered into six dimensions: self-assertiveness, interpersonal attraction, intelligence, life success, physical attractiveness and personal likability (details on clustering in footnote of Table 2). The psychology literature has provided substantial evidence that the six dimensions of person-perception are bound to be intercorrelated. Given these intercorrelations, multivariate analysis of variance (MANOVA) appeared to be conducive to statistical processing of data. For these

MANOVA-procedures, as well as for the performed ANOVA-procedures, all perceived improvements are defined at $P < 0.05$. The same holds true for the effects of perceiver's sex and age.

Results

The most striking result of this study is that only two of the 16 (12.5%) patients were assessed significantly more positive following facial plastic surgery using the multivariate analysis. These two were a male Otoplasty patient ($F = 2.24$) and a female rhinoplasty patient whose benign facial lesions were also excised ($F = 4.97$).

Univariate analyses revealed that reliable pre/post differences occurred in six perceived attributes in five of the 16 (31%) patients. Physical attractiveness was significantly affected by facial plastic surgery for three of the 16 (19%) patients. An identical percentage was obtained for the dimension of self-assertiveness. The remaining dimensions did not exhibit any reliable improvements after facial plastic surgery. Across all six dimensions and all 16 patients, 6% of the data reflected significantly more favourable social perceptions as a result of facial plastic surgery. The results of the univariate analyses are shown in Table 3.

When the subjects were divided at age 28, multivariate analysis did not yield reliable evidence of age implications on the perception of the stimulus persons following facial plastic surgery. In addition, the influence of the perceiver's sex was minor in this investigation, with significant multivariate effects in only 6% of the data.

Discussion

Clinicians involved in plastic surgery have paid too little attention to the work of social scientists studying physical appearance. An extensive and well-developed literature demonstrates that unattractive individuals are perceived more negatively than their attractive peers regarding traits, behaviour and skills.²⁴ Most of these studies related to surgery are based on judgement of photographs and reflect the role played by beauty on first impressions. The effect of attractiveness in the long run on a broader scope of social activity is more complex than the initial judgement.

Experiments using photographs have consistently postulated tangible results regarding social perception, similar to those of Vuyk *et al.*'s previous report.⁸⁻¹⁰ Although the preceding study of Vuyk *et al.*¹⁰ was closely replicated in terms of patients, number and sex-ratio of subjects and procedure, markedly different results were obtained in the current experiment. Thus, replacing pre- and postoperative photographs by digital prints in which no distinction apart from the surgical correction was possible, appeared to alter the social perception, as assessed. This replacement reduced the pre/post sur-

Table 2. Twenty variables evaluated on a 10-point scale*

1	Has a weak personality	1	2	3	4	5	6	7	8	9	10	Has a strong personality
2	Is a cold person	1	2	3	4	5	6	7	8	9	10	Is a warm person
3	Is unsociable	1	2	3	4	5	6	7	8	9	10	Is sociable
4	Is unfriendly	1	2	3	4	5	6	7	8	9	10	Is friendly
5	Is unkind	1	2	3	4	5	6	7	8	9	10	Is kind
6	Is untrustworthy	1	2	3	4	5	6	7	8	9	10	Is trustworthy
7	Is antisocial	1	2	3	4	5	6	7	8	9	10	Is social
8	Is lacking in self-confidence	1	2	3	4	5	6	7	8	9	10	Is self-confident
9	Is awkward	1	2	3	4	5	6	7	8	9	10	Is poised
10	Is sluggish	1	2	3	4	5	6	7	8	9	10	Is enthusiastic
11	Is unintelligent	1	2	3	4	5	6	7	8	9	10	Is intelligent
12	Is not knowledgeable	1	2	3	4	5	6	7	8	9	10	Is knowledgeable
13	Is unsuccessful at work/school	1	9	3	4	5	6	7	8	9	10	Is successful at work/school
14	Is not satisfied with life	1	2	3	4	5	6	7	8	9	10	Is satisfied with life
15	Leads a boring life	1	2	3	4	5	6	7	8	9	10	Leads a fascinating life
16	Is physically unattractive	1	2	3	4	5	6	7	8	9	10	Is physically attractive
17	Is unpleasant to look at	1	2	3	4	5	6	7	8	9	10	Is pleasant to look at
18	Is socially unattractive	1	2	3	4	5	6	7	8	9	10	Is socially attractive
19	Is not a good colleague	1	2	3	4	5	6	7	8	9	10	Is a good colleague
20	Is not a desirable friend	1	2	3	4	5	6	7	8	9	10	Is a desirable friend

* Data were clustered into the present six dimensions: self-assertiveness (questions 1, 8–10), interpersonal attractiveness (questions 2-7), intelligence (questions 11, 12), life success (questions 13-15), physical attractiveness (questions 16, 17) and personal likability (questions 18-20).

Table 3. Results of six dimensions given in Table 2*

Dimension	Improvement (%)	No difference (%)
1. Self-assertiveness	18.75	81.25
2. Interpersonal attraction	0.00	100.00
3. Intelligence	0.00	100.00
4. Life success	0.00	100.00
5. Physical attractiveness	18.75	81.25
6. Personal likability	0.00	100.00
All dimensions	6.25	93.75

* A positive preoperative to postoperative difference.

gery differences: whereas in the first experiment seven of the 15 patients were more positively assessed following facial plastic surgery,¹⁰ in the current experiment only two of the 16 were categorized more positively (forming part of the former group of seven as well). The univariate analyses revealed a proportional decrease when comparing both studies.

The mechanism of the influence of facial plastic surgery on social perception is only partly due to the enhanced facial features themselves. Kleck and Strenta demonstrated that persons, led to believe that they possessed a visible and negatively valued physical characteristic, perceived it to have adverse effects on others' behaviour in face-to-face interaction.²⁵ However, such effects were actually prevented by experimental control. Thus patients may have distorted perceptions of social reality due to their self-perceptions of physical deviance. Therefore, it is probably self-perception that ultimately must change. Thus modifying the self-stigmatizing attributes by

surgical alteration of the physical feature, may strengthen the patient's self-esteem. Actual reactions of the patient's established social world may serve to catalyse these self-perceptive changes. A growing self-esteem is likely to provide (further) motivation to care for appearance,²⁶ such as changes in hair-care, skin-care, make-up etc. It is impossible to exclude these, often subtle, improvements of appearance when photographs are used in experiments evaluating the implications of facial plastic surgery on social perception. Subsequently, subjects may have used the above-mentioned visual cues when passing judgement. However, when using digital prints merely distinguishable by the surgical correction, subjects were not exposed to the possibly confounding cues; thereby eliciting different results.

Methodological factors may account for these discordant results between the current and previous experiment. First, although both groups of subjects (of Vuyk *et al.*⁰ previous study and the current experiment) were similar in terms of number and sex-ratio, they were of course not identical. Second, as a consequence of subdued tone, digital prints possibly demonstrate less clearly any differences than the photographs used in the previous experiment, which may in part account for the difference in outcome.

Conclusion

The face is the single most distinguishing physical feature of any person. Previous research using photographic documentation has stated that altering facial features by facial plastic surgery influences the perception of patients by

subjects. In replicating one of these experiments but replacing the photographs by digital prints we gathered circumstantial evidence that confounding visual cues (e.g. self-confidence, hair-care, skin-care and make-up) might have influenced the perception of persons following facial plastic surgery in the preceding experiment. It is tentatively assumed that the role of facial plastic surgery is one of initiating a positive cycle by changing the patient's self-perception.

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