Article

Perception of Symmetry in Aesthetic Rhinoplasty Patients: Anthropometric, Demographic, and Psychological Analysis

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Abstract

Visual perception of symmetry is a major determinant of satisfaction after aesthetic rhinoplasty. In this study, we sought to investigate the existence of any relationship between anthropometric characteristics of the face and visual perceptions of asymmetry among rhinoplasty patients and to evaluate tools that can shed light on patients who appear at high risk for exaggerating potential asymmetries. In the first part, 168 rhinoplasty patients were asked to fill out the demographic questionnaire, nasal shape evaluation scale, and the somatosensory amplification scale. In the second part, we examined the relationship between anthropometric characteristics of the face and visual perceptions of asymmetry using standardized photographs of 100 medical students. In the third part, patients answered the rhinoplasty outcome evaluation questionnaire 6 months after the surgery. Objectively, no symmetrical face was observed in the anthropometric evaluation. Subjectively, only 73% and 54% of the faces were considered asymmetrical by the

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rhinoplasty and the control groups, respectively. The rate of asymmetry perception was significantly greater in revision patients when compared with primary rhinoplasty patients. The relationship between the rate of subjective perception of asymmetry and the somatosensory amplification scale scores was statistically significant. We found a significant inverse relationship between the rate of asymmetry perception and the rhinoplasty outcome evaluation scores. Plastic surgeons should be aware of this high selectivity in asymmetry perception, which is associated with poor postoperative satisfaction. Somatosensory amplification scale may help identify rhinoplasty patients at a high risk for exaggerating potential asymmetries.
Level of Evidence: III.

Introduction

Facial attractiveness is something that is intuitively perceived rather than measurable with instruments. Several studies have been conducted in order to define what people find attractive in faces (Rhodes, 2006). Over the centuries, the common notion in this topic has been that beauty is in the eye of the beholder—that the standards of attractiveness are learned by the historical and concurrent exposure to culturally imposed ideals. However, many studies have documented that people from different cultures share common standards of attractiveness (Langlois et al., 2000), suggesting that these standards are not culture bound. Along with the lack of consensus on this topic, attractive faces may have common universal features that are recognized across cultures.

There are many facial features that may indicate the genetic and biological quality of a person (Thornhill & Gangestad, 1993, 1999) and hence influence attractiveness as a mate. Evolutionary psychologists have focused on symmetry as an indicator of high developmental quality since it may signal the capability of a person to cope with environmental and genetic challenges during development (Komori, Kawamura, & Ishihara, 2009; Moller & Thornhill, 1998; Watson & Thornhill, 1994). For this reason, any association between quality and symmetry, no matter how weak, is sufficient to create a mate choice pressure on the opposite sex. However, this is a very controversial topic that is generally not supported by meta-analyses.

It has been proposed that the influence of symmetry on judgments of facial attractiveness increases dramatically toward the midline (Springer et al., 2007). For this reason, it is expected that asymmetries of midline facial structures, such as the nose, would affect the perception of attractiveness negatively. Consequently, it is not surprising that nasal differences that alter the symmetry of the face are concerning to patients, who often seek aesthetic rhinoplasty to correct their asymmetries (Guyuron & Bokhari, 1996).

Rhinoplasty is among the most difficult and unpredictable procedures in plastic surgery. One of the major causes of patient dissatisfaction after rhinoplasty is residual asymmetry (Nouraei, Pulido, & Saleh, 2009). In these cases, variations in the visual perception of symmetry among patients are at least as important as the anatomic symmetry of the nose (Ozturk, Gode, Karahan, & Midilli, 2015). Although some patients may neglect even obvious asymmetries, others tend to describe asymmetries that do not exist or exaggerate the severity of asymmetries that exist only to some degree.

Perception is the organization, identification, and interpretation of sensory information in order to understand the environment (Gregory, 1964). Perception is not the passive receipt

of physical signals but is connected with a person's concept, expectations, memory, and attention (Bernstein, 2002). For this reason, perception does not represent a one-on-one copy-paste representation of reality. Discrepancies exist between the perception of reality and the reality itself. This fact should be kept in mind during the preoperative evaluation of aesthetic rhinoplasty patients. Various processes such as expectations, motivations, emotions, previous knowledge, and memory can shape the perception in these patients. For this reason, it is important to identify before surgery those patients who may have poor outcomes despite a technically satisfactory postoperative result.

These facts influenced the design of the current study and our search for knowledge about the perception of symmetry in rhinoplasty patients. Our focus in the current study is to explore the existence of any correlation between objective anthropometric characteristics of the face and visual perceptions of asymmetry among these patients, and to evaluate tools that can shed light on patients who appear at high risk for exaggerating potential asymmetries. Our hypothesis was that the rate of subjective perception of facial asymmetry is greater in rhinoplasty patients compared with community participants.

Patients and Methods

Patient Recruitment

The protocol of the current study was approved by the institutional review board and Ethics Committee of the Başkent University Faculty of Medicine (Ankara, Turkey). All procedures were conducted in accordance with the Helsinki declaration. All participants signed an informed consent for the procedure; 246 patients that desired aesthetic rhinoplasty with or without functional septoplasty between November 2012 and May 2014 were asked to participate without any incentives provided. Exclusion criteria were age less than 18 years, the presence of craniofacial anomalies and possible body dysmorphic disorder (measured by initial psychiatric interview); 231 patients fulfilled the inclusion criteria and 223 agreed to join the study. In the screening stage of this study, two patients with possible body dysmorphic disorder were excluded. In the last part of the study, 53 patients who were not possible to reach by telephone (two attempts were made to contact each patient) were excluded to leave 168 participants. For the control group, we recruited 69 healthy adult volunteers who do not desire aesthetic or functional rhinoplasty from the staff of the clinic and their families.

Questionnaires

We informed all participants about the study procedures. Thereafter, we asked them to complete three questionnaires anonymously on the same day. Members of the rhinoplasty group completed the questionnaires before the operation (Appendix).

1. Demographic information sheet. This six-question survey asks participants about age, gender, marital status, history of psychiatric disorder, and previous history of rhinoplasty or aesthetic operations other than rhinoplasty.
2. Nasal shape evaluation scale. In this scale, all members of the control and rhinoplasty groups were asked to evaluate the physical appearance of their nose using a visual scale ranging from 0 (*very bad*) to 10 (*perfect*; Picavet, Prokopakis, Gabriels, Jorissen, & Hellings, 2011).
3. Somatosensory amplification scale (SSAS). This 10-item questionnaire was designed to evaluate the tendency to catastrophize normal somatic sensations (Barsky, Wyshak, &

Klerman, 1990). Each item is estimated on a scale ranging from 1 (*not at all true*) to 5 (*extremely true*). Higher scores are associated with greater tendency to amplify normal somatic sensations.

Perceptual Domain Analysis

In the second part of the current study, we investigated the existence of any correlation between anthropometric characteristics of the face and visual perceptions of asymmetry using the anteroposterior photographs of 100 medical students taken in the Frankfurt plane.

The photographed subjects were 100 medical students (53 males and 47 females) with an average age of 24.3 (range: 23–26 years). The selection criteria included balanced and good soft tissue profile, no history of previous maxillofacial trauma, maxillofacial surgery, or orthodontic treatment. Signed informed consent for photography was obtained from all students. Each subject was instructed to stand on a line on the floor. The vertical position of the camera (Canon Inc., Tokyo, Japan) was adjusted according to the height of each subject. A plummet was suspended from a black string as a vertical reference line on the photographs. Following these procedures, the anteroposterior photographs were captured.

Photographs were inspected using Image-Pro Plus 6.0 (Media Cybernetics, Inc., Silver Spring, MD) software. Based on soft tissue landmarks of the face, anthropometric measurements were performed starting with a sagittal midline toward the medial and lateral canthus, alar margin, tragus and oral commissure, as shown in Figure 1. Then, we converted the obtained absolute values to ratios by dividing the measurements from both sides. Because the laterality of asymmetry was not important in our study, we always calculated the ratio by dividing the smaller value by the larger. Each measurement was
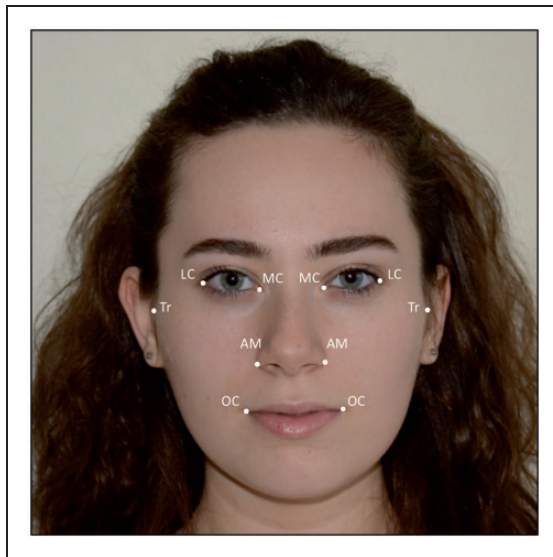
Figure 1. Anatomical landmarks for anthropometric facial measurements as demonstrated on a 23-year-old woman, a medical student from the study. MC = medial canthus; LC = lateral canthus; Tr = tragus; AM = alar margin; OC = oral commissure.

considered symmetrical if the ratio was equal to 1. All measurements were done by the second author (A. K.). We randomly selected 15% of all measurements to be evaluated again, and reliability was checked by the intraclass correlation coefficient. Consistency varied between 0.937 and 0.994, showing that the measurements were reliable (Table 1).

We imported the photographs into PowerPoint (Microsoft Corp, Redmond, WA) and showed them sequentially to every member in the control and rhinoplasty groups. Participants were given 5 s to view each photograph, followed by a period of 4 s during which the participant was asked to define the face as symmetrical or asymmetrical. Viewing time was kept short in order to obtain the first impression of the participant about the symmetry of the face. A 3-min break was introduced after every 20 photographs.

Rhinoplasty Outcome Evaluation

In the third part of the study, we evaluated the degree of patients' preoperative and postoperative satisfaction with their nasal performance using the rhinoplasty outcome evaluation (ROE) questionnaire. Six months postoperatively, all members of the rhinoplasty group were invited by telephone call to visit the clinic and fill out the questionnaire (Alsarraf et al., 2001). Patients completed the ROE questionnaire twice during the same visit so that their satisfaction could be measured in both preoperative and postoperative situations. In the first questionnaire, preoperative satisfaction was evaluated based on photographs recorded before the surgery. The second questionnaire evaluated each patient's actual outcome. This questionnaire is composed of six questions about the degree of patient satisfaction. Each question was answered with marks of a scale ranging from 0 to 4 (0 for the most negative and 4 for the most positive answer). The sum of the scores for each question, divided by 24 and multiplied by 100 gives the final score. Higher scores are indicative of greater satisfaction. Because all patients were operated by the same experienced surgical team, surgeon bias was removed.

Statistical Analysis

Post hoc power analysis by using sample and effect sizes was performed to determine the power of the study. We have got 93% value on power calculation. Homogeneity of group's variances was checked by Levene's test. Compliance with the normal distribution of

Table 1. The Evaluation of Consistency Between the Anthropometric Measurements.

Measurement	ICC	p
MC_{Left}	0.971	<.001
LC_{Left}	0.965	<.001
Tr_{Left}	0.994	<.001
AM_{Left}	0.937	<.001
OC_{Left}	0.945	<.001
MC_{Right}	0.986	<.001
LC_{Right}	0.951	<.001
Tr_{Right}	0.983	<.001
AM_{Right}	0.991	<.001
OC_{Right}	0.943	<.001

ICC = intraclass correlation coefficient; MC = medial canthus; LC = lateral canthus; Tr = tragus; AM = alar margin; OC = oral commissure.

continuous variables was checked with Shapiro–Wilk test. According to the results, to compare two independent groups, either the independent samples t test or the Mann–Whitney U test was used. Kruskal–Wallis test was used to compare multiple independent groups. The Wilcoxon signed-rank test was used to compare two related samples. Correlations between variables were evaluated using Spearman's rho correlation coefficient or Pearson correlation coefficient. Chi-square or fisher exact tests were used also. Data analyses were performed using the Statistical Package for the Social Sciences, version 17.0 (SPSS Inc., Chicago, IL, USA; license number 1093910). Results were considered statistically significant at $p < .05$.

Results

Patient Characteristics

A total of 168 patients (67 males and 101 females) who fulfilled the inclusion criteria were enrolled in the study as the rhinoplasty group. The ages of our patients ranged from 18 to 46 years, with an average of 31.2 years. The control group was composed of 69 participants (26 males and 43 females) with an average age of 35.1 (range: 20–42 years). Demographic characteristics of both groups are shown in Table 2.

All rhinoplasty operations were performed by the first author (O. L. A) only using the open approach. Early postoperative complications encountered include mucoperichondrial flap laceration (six patients, 3.5%), postoperative bleeding (three patients, 1.7%), septal hematoma (one patient, 0.6%), localized abscesses along columellar incision (two patients, 1.2%), and wound dehiscence (one patient, 0.6%).

Table 2. Demographic Characteristics of the Control Group and the Rhinoplasty Population.

Demographic characteristic	Control group $n = 69$	Rhinoplasty group $n = 168$
Age, years ± SD (min–max)	35 ± 6 (20–42)	31 ± 7 (18–46)
Sex, no. (%)		
Female	43 (62)	101 (60)
Male	26 (38)	67 (40)
Marital status, no. (%)		
Single	28 (41)	67 (40)
Divorced	5 (7)	12 (7)
Married	36 (52)	89 (53)
Previous aesthetic operations, no. (%)		
No	67 (97)	149 (89)
Yes	2 (3)	19 (11)
Previous rhinoplasty, no. (%)		
No	–	114 (68)
Yes	–	54 (32)
Psychiatric history, no. (%)		
No	67 (97)	158 (94)
Yes	2 (3)	10 (6)

Results of Subjective Perception of Facial Asymmetry

In the anthropometric evaluation of the anteroposterior photographs of 100 medical students, no totally symmetrical face was observed, and there were different degrees of asymmetry in one or more of the anthropometric measurements (Figure 2). However, only $73.26 \pm 11.62\%$ of faces were considered asymmetrical on subjective evaluation by members of the rhinoplasty group. On the other hand, the rate of subjective perception of the facial asymmetry was $54.03 \pm 10.28\%$ in the control group (Figure 3). This difference was statistically significant ($p < .001$, $z = -7.41$). We were not able to define a threshold of asymmetry above which faces were perceived as asymmetrical. Figure 4 shows a dot plot of the degree of asymmetry in the anthropometric measurements between faces that were perceived as asymmetrical or symmetrical.
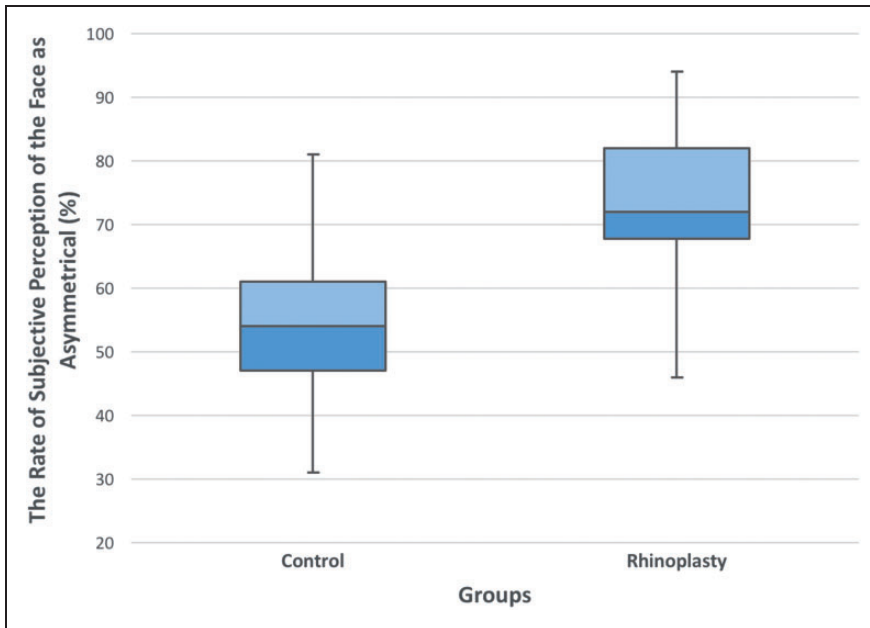
Subjective Perception of Facial Asymmetry in Relation to Patients' Characteristics

In the rhinoplasty group, subgroup analysis was performed to determine any relationship between perception of symmetry and patients' sociodemographic characteristics. There was no significant relationship between the rate of subjective perception of facial asymmetry and age ($p = .721$, $z = -0.65$), gender ($p = .167$, $z = -1.39$), social status ($p = .856$, $z = -0.53$), and history of aesthetic procedure other than rhinoplasty ($p = .523$, $z = -2.23$). We noticed that positive history of rhinoplasty was a factor which influenced the perception of asymmetry (Table 3). Thirty-two percent of the rhinoplasty group had a history of previous rhinoplasty. The rate of subjective perception of facial asymmetry was significantly higher in patients seeking revision rhinoplasty ($79.46 \pm 10.13\%$) in comparison with primary rhinoplasty patients ($70.20 \pm 11.31\%$; $p < .001$, $z = -4.83$; Figure 5). Ten patients were positive for psychiatric history with the diagnosis of depression. However, statistical analysis failed to
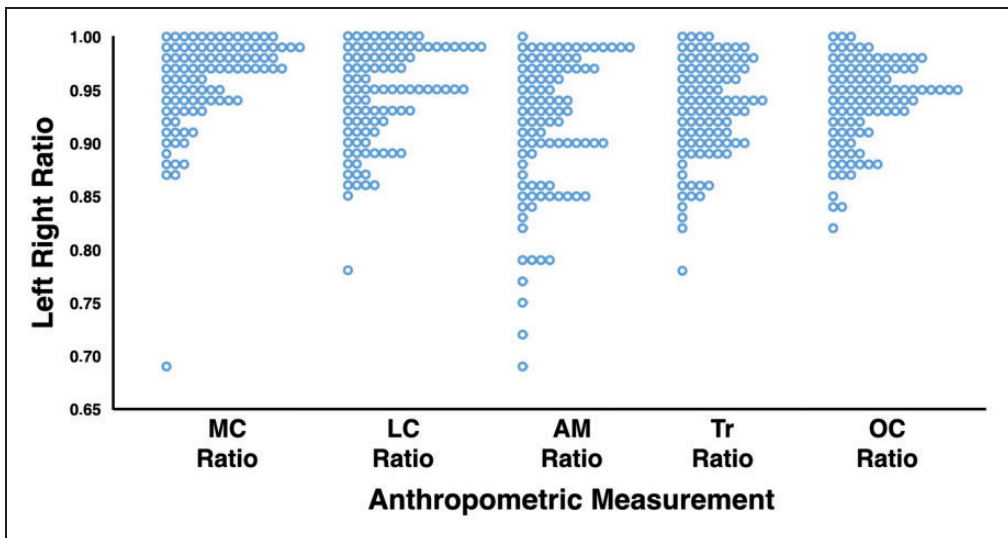
Figure 2. Dot plot of the degree of facial asymmetry. Each dot represents the degree of asymmetry of an individual anthropometric measurement.

Figure 3. Results of subjective perception of the face as asymmetrical in the control and rhinoplasty groups ($p < .001$).

show significant relationship between the rate of subjective perception of asymmetry and psychiatric history ($p = .095$, $z = -1.67$).

Correlation Between Subjective Perception of Facial Asymmetry and Evaluation of Nasal Difference

We analyzed the relationship between patient's self-perception of nasal beauty and symmetry perception. The results of nasal shape evaluation are shown in Figure 6. None of the rhinoplasty patients scored his nose as wonderful (10 points), whereas 15 patients (9%) scored their nose as very bad (0 points). Only 24 patients' (14%) evaluation resulted in a score higher than 5. In the control group, none of the participants has scored his nose as perfect (10 points), whereas one participant scored his nose as very bad (0 points); 39 participants' (56%) evaluation resulted in a score higher than 5. We found no significant relationship between the rate of subjective perception of facial asymmetry and the scores of nasal shape evaluation (spearman rho $= -0.043$, $p = .580$).

Correlation Between Subjective Perception of Facial Asymmetry and SSAS Scores

We evaluated the levels of somatic amplification in the rhinoplasty group and compared the results with those obtained in the control group. No significant difference was observed between both groups with respect to SSAS scores ($p = 0.35$, $z = -3.8$; Table 4). In the rhinoplasty group, we found a significant positive correlation between the rate of subjective perception of the facial asymmetry and the scores obtained in the SSAS (spearman rho $= 0.62$, $p < .001$; Figure 7).
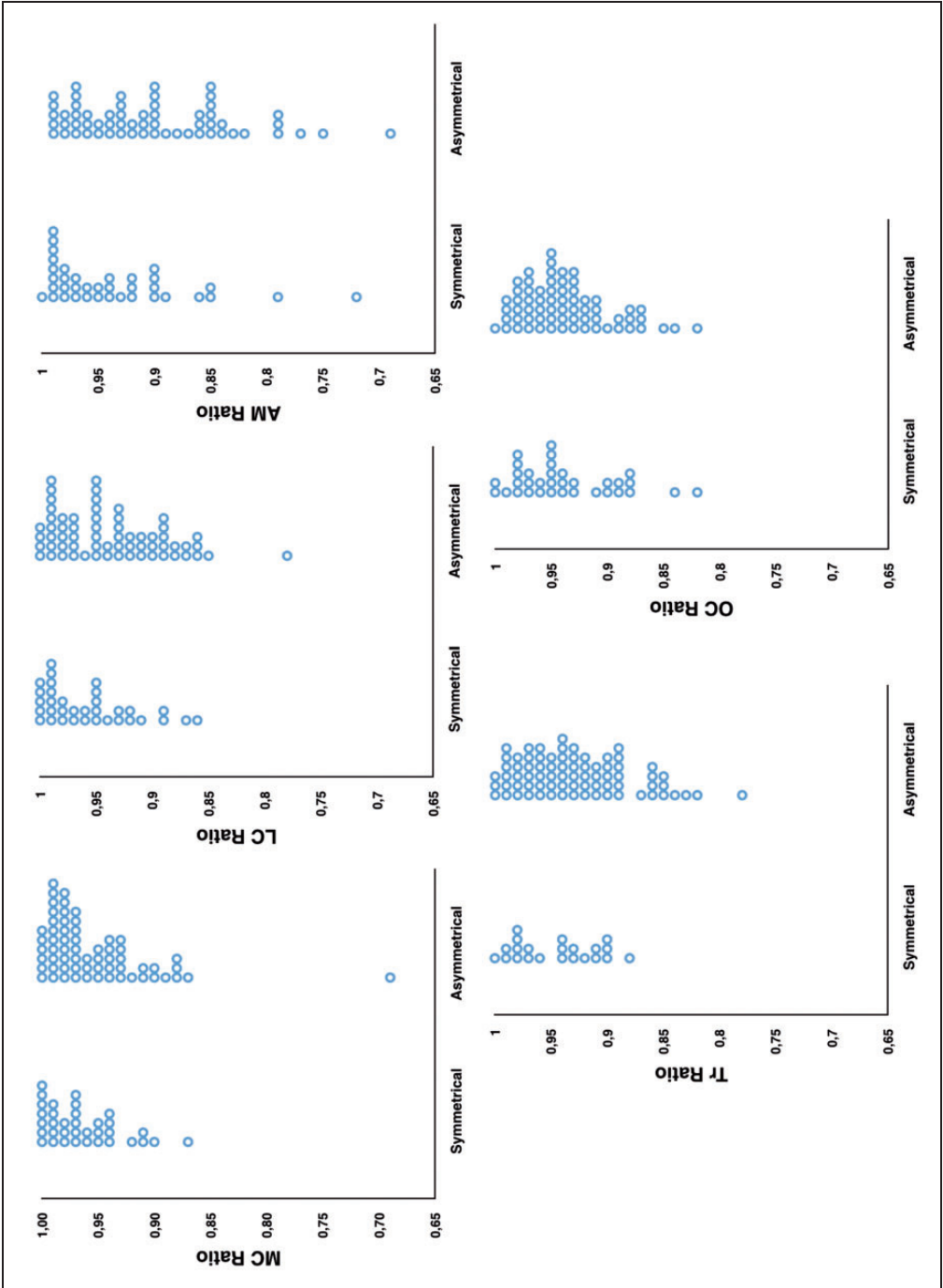
Figure 4. Dot plot of the degree of asymmetry in the anthropometric measurements between faces that were perceived as asymmetrical or symmetrical.

Table 3. The Rate of Subjective Perception of the Face as Asymmetrical in Relation to Patients'
Characteristics.

|	Control group Mean (SD)	Rhinoplasty group Mean (SD)
	$n = 69$	$n = 168$
Sex		
Female	52.90 (11.02)	74.18 (11.15)
Male	55.84 (11.67)	71.89 (12.23)
P	.764	.167
Marital status		
Single	52.25 (11.17)	72.89 (12.21)
Divorced	62.60 (15.50)	75.36 (10.43)
Married	54.19 (10.49)	73.26 (11.14)
P	.725	.856
Previous aesthetic operations		
No	54.35 (11.10)	72.55 (11.73)
Yes	42.50 (12.02)	78.78 (9.24)
P	.324	.523
Previous rhinoplasty		
No	–	70.20 (11.31)
Yes	–	79.46 (10.13)
P	–	<.001
Psychiatric history		
No	53.79 (11.32)	72.91 (11.68)
Yes	61.50 (7.77)	78.70 (9.59)
P	.258	.095
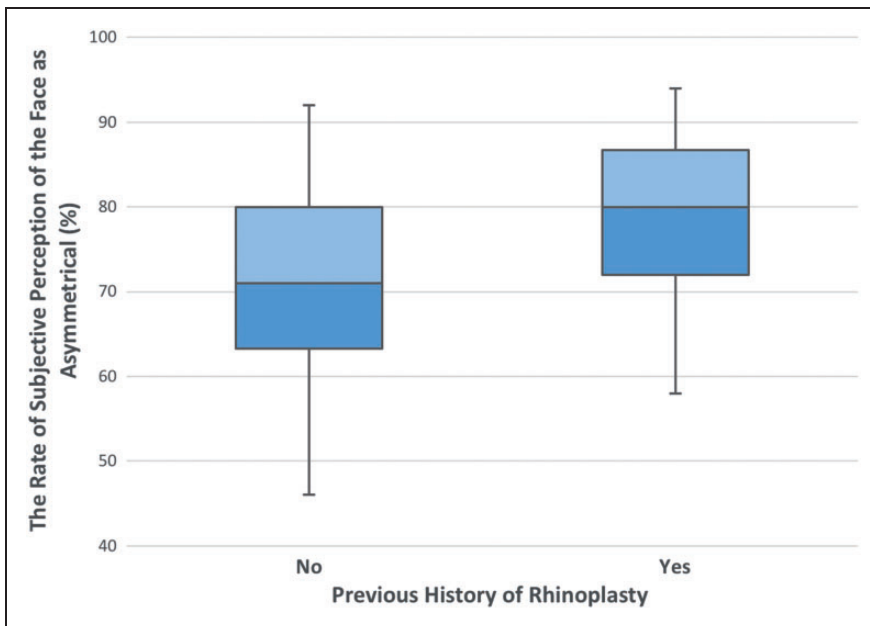
Figure 5. Results of subjective perception of the face as asymmetrical in primary and revision rhinoplasty
patients ($p < .001$).
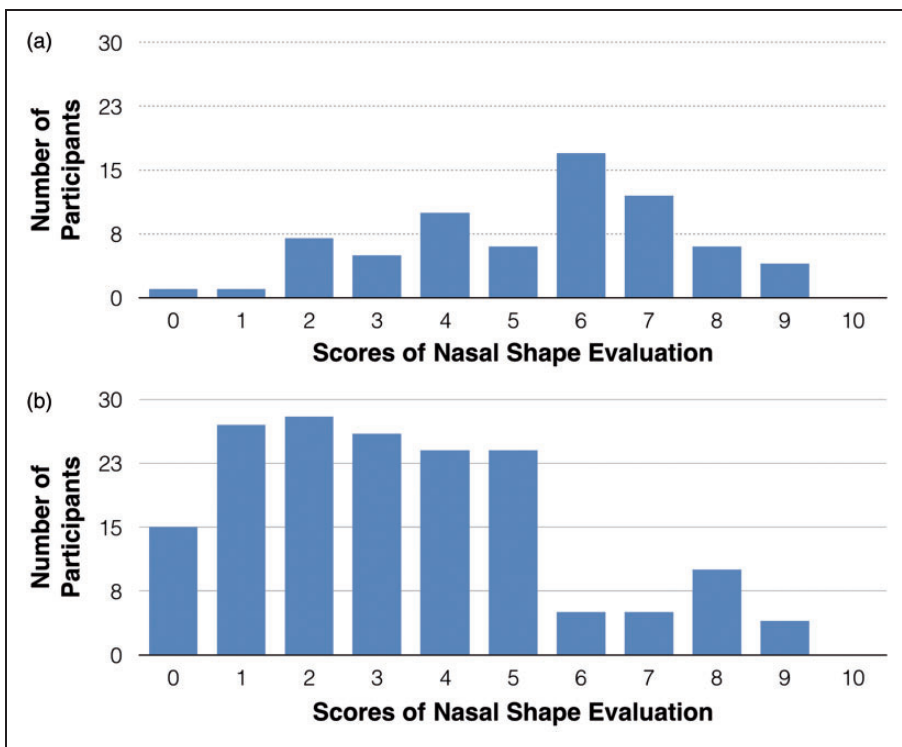
Figure 6. The results of nasal shape evaluation in the control (a) and rhinoplasty (b) groups.

Table 4. Comparison of Somatosensory Amplification Scale Scores of Control and Rhinoplasty Groups.

| Somatosensory amplification scale	Control Mean (SD)	Rhinoplasty Mean (SD)	p
When someone else coughs, it makes me cough too	1.42 (1.05)	1.63 (0.87)	.55
I cannot stand smoke, smog, or pollutants in the air	2.33 (1.20)	2.76 (1.41)	.31
I am often aware of various things happening within my body	2.26 (0.84)	3.39 (1.23)	1.14
When I bruise myself, it stays noticeable for a long time	2.19 (1.08)	2.36 (1.43)	.41
Sudden loud noises really bother me	2.42 (1.13)	2.53 (1.44)	.36
I can sometimes hear my pulse or my heartbeat throbbing in my ear	3.20 (1.09)	3.42 (1.39)	.37
I hate to be too hot or too cold	2.69 (1.23)	2.74 (1.32)	1.12
I am quick to sense the hunger contractions in my stomach	2.26 (1.31)	2.57 (1.31)	.61
Even something minor, like an insect bite or a splinter, really bothers me	2.47 (1.15)	2.65 (1.54)	1.13
I have a low tolerance for pain	2.74 (1.12)	3.56 (1.33)	.25
Total	23.98 (8.23)	27.61 (7.34)	.35
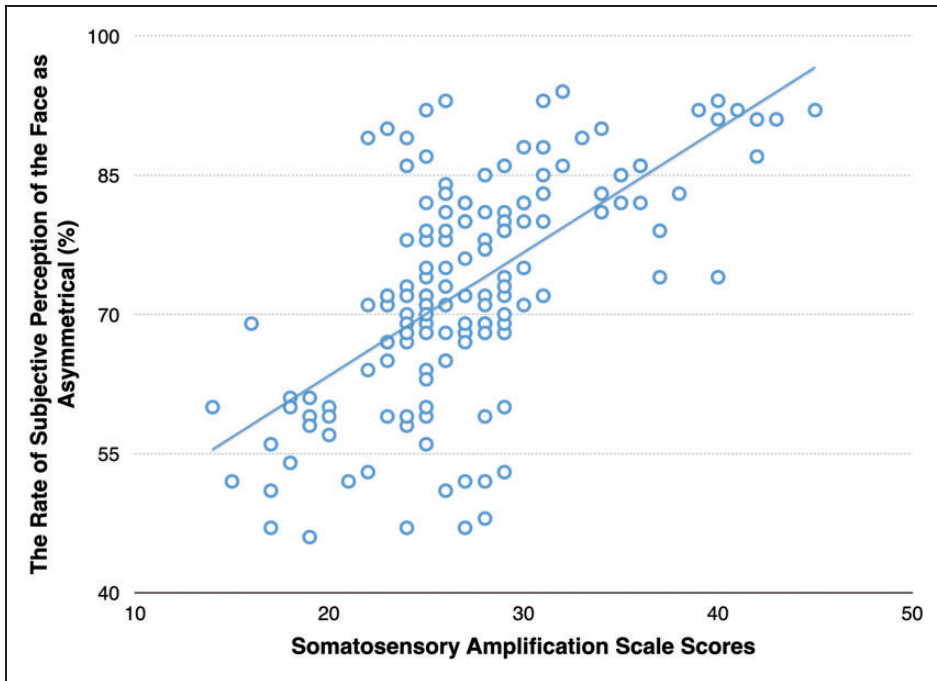
Figure 7. Correlation between subjective perception of facial asymmetry and somatosensory amplification scale scores in the rhinoplasty group (spearman rho = 0.62, $p < .001$).

Correlation Between Subjective Perception of Facial Asymmetry and ROE Scores

The mean preoperative satisfaction score of the patients was 30.31 ± 7.57 and in the postoperative it reached 76.67 ± 11.47 (Figure 8). There was a difference between the mean scores in the preoperative and postoperative of 46.36 ± 10.43 ($p < .001$, $z = -14.25$). We found no significant correlation between preoperative nasal shape evaluation scale scores and the ROE questionnaire scores (spearman rho = 0.012, $p = .878$). We found a significant inverse correlation between the rate of subjective perception of facial asymmetry and the scores gained in the ROE questionnaire (spearman rho = -0.46, $p < .001$; Figure 9).

Discussion

Anthropometric measurements of the anteroposterior photographs of medical students provided objective values about the symmetry of the face. Similar to previous reports (Carvalho et al., 2012; Chatrath et al., 2007), none of the photographed subjects had a perfectly symmetrical face. However, this does not mean that these faces are unattractive. Peck and Peck (1970) hypothesized that the construct of facial attractiveness can tolerate a noticeable degree of asymmetry, which individualizes the beautiful face, rather than to disfigure it. This fact emphasizes the importance of documenting the presence of preoperative asymmetries. In the clinical practice, most rhinoplasty patients have been evaluated by visual inspection alone. However, anthropometric measurements in these patients would provide quantitative data about the presence and degree of facial asymmetries to make more objective assessments both pre- and postoperatively.
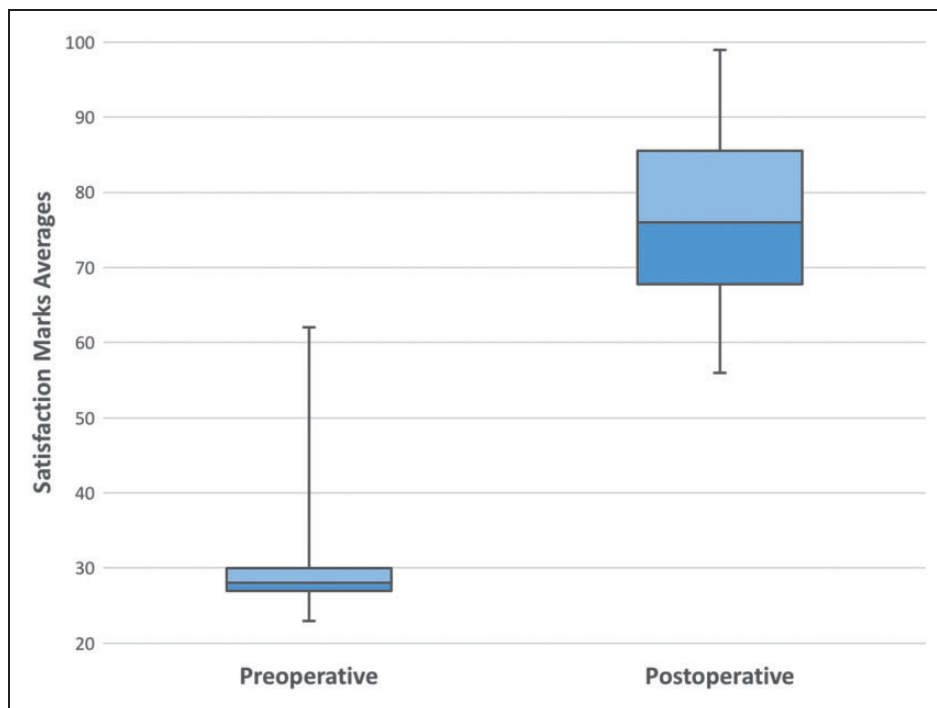
Figure 8. Satisfaction marks averages in the preoperative and postoperative approaches of the rhinoplasty patients ($p < .05$).

We found a disparity between the objective anthropometric measurements, showing various degrees of facial asymmetry in all volunteers, and the rate of subjective perception of asymmetry, which was fewer than 70% when both groups had been taken into consideration. This finding suggests that the anthropometric measurements are not good determinants of subjective perception of the face as symmetrical or asymmetrical. In addition to the anthropometric values, there is subjective perception (Chatrath et al., 2007). Most of us would not notice slight asymmetries when looking at other people's faces, unless we looked carefully for them. Kowner (2001) hypothesized factors that hinder us from discerning such facial asymmetries. First, slight asymmetries of the face can be noticed only from limited angles such as completely frontal view (Fisher & Cox, 1975). Second, the visual scanning system in the brain may prevent the detection of such facial asymmetries. This is because our visual exploration is limited only to one hemiface even we do look at the faces from a frontal view (Walker-Smith, Gale, & Findlay, 1977). This is in association with the common left visual field bias when individuals processes faces (Gilbert & Bakan, 1973). Finally, people generally avoid looking directly at faces more than shortly because of perceptual and social reasons.

When the two groups were compared, the rate of subjective perception of facial asymmetry was greater in the rhinoplasty group. We think that the process that provides this high selectivity in asymmetry perception is the fact that vertically oriented asymmetries are processed more efficiently than horizontally oriented ones even when the degree of asymmetry is identical (Deregowski, 1971; Palmer & Hemenway, 1978). For example, it has been shown that even infants habituate more quickly to vertically symmetrical patterns than to horizontally symmetrical ones (Pornstein & Krinsky, 1985). In rhinoplasty patients,
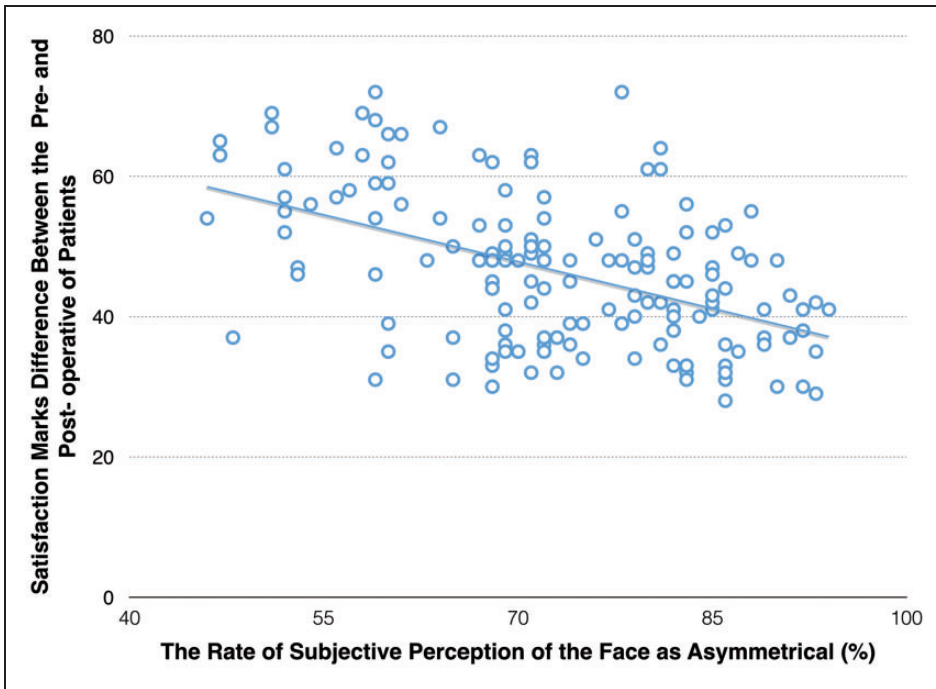
Figure 9. Correlation between subjective perception of facial asymmetry and rhinoplasty outcome evaluation (spearman rho $= -0.46$, $p < .001$).

prolonged preoccupation with nasal shape may have increased awareness of this specific feature within the mental image, leading to a relative magnification of certain aspects and focused attention to the nose which represents the only vertically oriented feature of the face (Anthony & Stein 2008; Coon, 2000). On the other hand, horizontally asymmetrical patterns such as the eyes, ears, and mouth may have received less attention. Considering that the highest degree of asymmetry was observed in the midline to lateral alar margin measurement, it is not surprising that significantly higher number of faces were considered to be asymmetrical by the rhinoplasty group.

We believe that the observed high selectivity in asymmetry perception may contribute to the poor outcomes that may occur despite technically satisfactory results after rhinoplasty. For this reason, we think that the patient should be involved to a greater extent in the evaluation and planning processes in order to ensure a realistic assessment. In addition, the patient should be made aware that slight asymmetries, that are really difficult to detect, may persist after rhinoplasty.

There was no significant relationship between age, gender, social status, history of aesthetic surgeries other than rhinoplasty, and the results of perceptual domain analysis. According to these findings, the first three components in the acronym SIMON (single, immature, male, over-expectant, and narcissistic) are not associated with increased selectivity in asymmetry perception (Gorney & Martello, 1999).

In this study, we found no correlation between subjective perception of asymmetry and the presence of psychiatric history. We can explain this situation by the low rate of mental illness among members of our rhinoplasty group. Only 6% (10 patients with the diagnosis of depression) of our patients were positive for a mental disorder. This rate is significantly

lower than rates reported in the literature (20%–48%; Ishigooka et al., 1998; Sarwer et al., 2004). We think that people are still reluctant to seek professional help for mental health and to provide information about their psychiatric history.

Revision rhinoplasty is often much more challenging operation than primary rhinoplasty because the surgeon has to deal with cosmetic or functional problems from the previous surgery. About one third of our patients applied for revision rhinoplasty. The rate of subjective perception of facial asymmetry was significantly higher in the patients seeking revision rhinoplasty. This finding helps to explain why satisfaction rates are lower in revision rhinoplasty patients compared with those of patients seeking primary rhinoplasty (Hellings & Nolst Trenite, 2007). The preoperative consultation in revision patients should include a more careful assessment of patient suitability and psychological motivations. Establishing an honest relationship with patients and understanding their concerns and expectations are equally as important as having the surgical skills to correct the documented nasal differences.

We found no correlation between the rate of subjective perception of facial asymmetry and the patients' evaluation of his or her nose. This shows that the high selectivity in asymmetry perception is not correlated to the patients' perception of his or her nasal difference.

Somatization implies a tendency to catastrophize normal somatic sensations. It is a result of the body's attempt to cope with psychological stress (Lipowski, 1988). In this study, we suggested that prolonged preoccupation with nasal difference may be associated with chronic psychological stress that can lead to somatization like symptoms (e.g., exaggerating the severity of asymmetries that exist only to some degree). It has been hypothesized that somatosensory amplification may explain the variability of the symptom reports among patients who have a diagnosis of the same disease such as upper respiratory tract infection and chronic pain (Ak & Yontem, 2004; Kosturek, Gregory, Sousou, & Trief, 1998; Muramatsu et al., 2002). For this reason, evaluation with the Turkish version of SSAS was carried out (Gulec & Sayar, 2007). There was a significant positive correlation between the rate of subjective perception of the facial asymmetry and the SSAS scores. We believe that conducting this easy-to-use questionnaire in the preoperative evaluation can shed light on patients with high risk of exaggerating possible postoperative residual asymmetries.

All our patients obtained a recovery from rhinoplasty with the postoperative satisfaction score greater than that of the preoperative. However, high selectivity in facial asymmetry perception was found to be associated with lower levels of satisfaction after the surgery. There was an inverse correlation between the rate of subjective perception of facial asymmetry and the scores gained in the ROE questionnaire. Upon assessment of the reasons by which patients maintained poor satisfaction after the operation, we noticed that the aesthetics remained an important complaint after rhinoplasty. Our method, retrospective evaluation of patients' preoperative satisfaction, and prospective assessment of the patients' postoperative satisfaction, was similar to previous studies (Arima, Velasco, & Tiago, 2011, 2012; Hellings & Nolst Trenite, 2007). In all these studies, the degree of preoperative satisfaction was determined using standardized preoperative photographs.

One of the major technical drawbacks of our study is that we have not asked the patients to address the localization of asymmetry on the face during perceptual domain analysis. For this reason, we could not determine if there was a focused selectivity in detection of nasal asymmetries. We just obtained the global first impression of the viewer about the symmetry of the face as a whole. Another limitation of our experiment is that our methodology did not allow us to determine the mechanisms behind high selectivity of asymmetry perception in rhinoplasty patients. However, we believe that our study represents a starting point for further studies that investigate facial information usage.

Conclusion

We think that the cosmetic surgeon should be aware of this high selectivity in asymmetry perception which is associated with poor postoperative satisfaction. Even in the best of hands, it is not unusual for a small degree of asymmetry to persist after the rhinoplasty. Before the operation, the patient should be made aware of this potential problem and reassured that these slight asymmetries are really difficult to detect. This is especially important in patients applying for revision rhinoplasty. In such cases, the SSAS may help identify rhinoplasty patients at a high risk for exaggerating potential asymmetries.

Sort of Glossary to Explain the Considerable Number of Medical Technical Terms Used

- *Rhinoplasty:* Procedure in Plastic, Reconstructive and Aesthetic Surgery in which the structure of the nose is changed, mainly for cosmetic reasons.
- *Revision rhinoplasty:* Secondary correction procedure on a patient who had a failed rhinoplasty before.
- *Anthropometric measurement:* A quantitative technique that measures specific dimensions of the body.
- *Functional septoplasty:* Procedure in Plastic, Reconstructive and Aesthetic Surgery in which the septum of the nose (separation between two nostrils) is corrected in order to correct deregulated air flow caused by deviated septum. It can be performed separately or in combination with rhinoplasty.
- *Orthodontic treatment:* The use of devices to to move teeth or adjust the underlying bones.
- *Mucoperichondrial flap laceration*: A complication of septoplasty that occurs when the soft tissue that covers the nasal septum is accidently injured.
- *Septal hematoma:* Accumulation of blood in the nasal septum after septoplasty.
- *Wound dehiscence*: Breaking open of the surgical incision along the suture.

Authors' Contribution

Name of the author	Types of contribution
Ozan Luay Abbas	Corresponding author
Ayla Kurkcuoglu	Anthropometric measurements
Cigdem Derya Aytop	Evaluation of asymmetry perception
Cengiz Uysal	Psychiatric assessment
Can Pelin	Anthropometric analysis

Declaration of Conflicting Interests

Ethical Approval

All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards. Informed consent was given by all participants, who were included in this study.

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References

Ak, I. S. K., & Yontem, T. (2004). Alexithymia, somatosensory amplification and counter- dependency in patients with chronic pain. *The Pain Clinic*, *16*, 43–51.

Alsarraf, R., Larrabee, W. F. Jr., Anderson, S., Murakami, C. S., & Johnson, C. M. Jr. (2001). Measuring cosmetic facial plastic surgery outcomes: A pilot study. *Archives of Facial Plastic Surgery*, *3*, 198–201.

Anthony, M. M., & Stein, M. B. (2008). *Oxford handbook of anxiety and related disorders*. Oxford, England: Oxford University Press.

Arima, L. M., Velasco, L. C., & Tiago, R. S. (2011). Crooked nose: Outcome evaluations in Rhinoplasty. *Brazilian Journal of Otorhinolaryngology*, *77*, 510–515.

Arima, L. M., Velasco, L. C., & Tiago, R. S. (2012). Influence of age on rhinoplasty outcomes evaluation: A preliminary study. *Aesthetic Plastic Surgery*, *36*, 248–253.

Barsky, A. J., Wyshak, G., & Klerman, G. L. (1990). The somatosensory amplification scale and its relationship to hypochondriasis. *Journal of Psychiatric Research*, *24*, 323–334.

Bernstein, D. A. (2002). *Essentials of psychology*. Boston, MA: Houghton Mifflin.

Carvalho, B., Ballin, A. C., Becker, R. V., Berger, C. A., Hurtado, J. G., & Mocellin, M. (2012). Rhinoplasty and facial asymmetry: Analysis of subjective and anthropometric factors in the Caucasian nose. *International Archives of Otorhinolaryngology*, *16*, 445–451.

Chatrath, P., De Cordova, J., Nouraei, S. A., Ahmed, J., & Saleh, H. A. (2007). Objective assessment of facial asymmetry in rhinoplasty patients. *Archives of Facial Plastic Surgery*, *9*, 184–187.

Coon, D. (2000). *Essentials of psychology: Exploration and application*. Belmont, CA: Wadsworth Pub. Co.

Deregowski, J. B. (1971). Symmetry, gestalt and information theory. *Quarterly Journal of Experimental Psychology*, *23*, 381–385.

Fisher, G. H., & Cox, R. L. (1975). Recognizing human faces. *Applied Ergonomics*, *6*, 104–109.

Gilbert, C., & Bakan, P. (1973). Visual asymmetry in perception of faces. *Neuropsychologia*, *11*, 355–362.

Gorney, M., & Martello, J. (1999). Patient selection criteria. *Clinics in Plastic Surgery*, *26*, 37–40, vi.

Gregory, R. L. (1964). Human perception. *British Medical Bulletin*, *20*, 21–26.

Gulec, H., & Sayar, K. (2007). Reliability and validity of the Turkish form of the Somatosensory Amplification Scale. *Psychiatry and Clinical Neurosciences*, *61*, 25–30.

Guyuron, B., & Bokhari, F. (1996). Patient satisfaction following Rhinoplasty. *Aesthetic Plastic Surgery*, *20*, 153–157.

Hellings, P. W., & Nolst Trenite, G. J. (2007). Long-term patient satisfaction after revision rhinoplasty. *Laryngoscope*, *117*, 985–989.

Ishigooka, J., Iwao, M., Suzuki, M., Fukuyama, Y., Murasaki, M., & Miura, S. (1998). Demographic features of patients seeking cosmetic surgery. *Psychiatry and Clinical Neurosciences*, *52*, 283–287.

Komori, M., Kawamura, S., & Ishihara, S. (2009). Averageness or symmetry: Which is more important for facial attractiveness? *Acta Psychologica (Amsterdam)*, *131*, 136–142.

Kosturek, A., Gregory, R. J., Sousou, A. J., & Trief, P. (1998). Alexithymia and somatic amplification in chronic pain. *Psychosomatics*, *39*, 399–404.

Kowner, R. (2001). Psychological perspective on human developmental stability and fluctuating asymmetry: Sources, applications and implications. *British Journal of Psychology*, *92*, 447–469.

Langlois, J. H., Kalakanis, L., Rubenstein, A. J., Larson, A., Hallam, M., & Smoot, M. (2000). Maxims or myths of beauty? A meta-analytic and theoretical review. *Psychological Bulletin*, *126*, 390–423.

Lipowski, Z. J. (1988). Somatization: The concept and its clinical application. *American Journal of Psychiatry*, *145*, 1358–1368.

Moller, A. P., & Thornhill, R. (1998). Bilateral symmetry and sexual selection: A meta-analysis. *American Naturalist*, *151*, 174–192.

Muramatsu, K., Miyaoka, H., Muramatsu, Y., Fuse, K., Yoshimine, F., Kamijima, K., . . . Sakurai, K. (2002). The amplification of somatic symptoms in upper respiratory tract infections. *General Hospital Psychiatry*, *24*, 172–175.

Nouraei, S. A., Pulido, M. A., & Saleh, H. A. (2009). Impact of rhinoplasty on objective measurement and psychophysical appreciation of facial symmetry. *Archives of Facial Plastic Surgery*, *11*, 198–202.

Ozturk, K., Gode, S., Karahan, C., & Midilli, R. (2015). Assessing the rhinoplasty outcome: Inter-rater variability of aesthetic perception in the light of objective facial analysis. *European Archives of Otorhinolaryngology*, *272*, 3709–3713.

Palmer, S. E., & Hemenway, K. (1978). Orientation and symmetry: Effects of multiple, rotational, and near symmetries. *Journal of Experimental Psychology: Human Perception & Performance*, *4*, 691–702.

Peck, H., & Peck, S. (1970). A concept of facial esthetics. *Angle Orthodontist*, *40*, 284–318.

Picavet, V. A., Prokopakis, E. P., Gabriels, L., Jorissen, M., & Hellings, P. W. (2011). High prevalence of body dysmorphic disorder symptoms in patients seeking Rhinoplasty. *Plastic and Reconstructive Surgery*, *128*, 509–517.

Pornstein, M. H., & Krinsky, S. J. (1985). Perception of symmetry in infancy: The salience of vertical symmetry and the perception of pattern wholes. *Journal of Experimental Child Psychology*, *39*, 1–19.

Rhodes, G. (2006). The evolutionary psychology of facial beauty. *Annual Review of Psychology*, *57*, 199–226.

Sarwer, D. B., Zanville, H. A., LaRossa, D., Bartlett, S. P., Chang, B., Low, D. W., & Whitaker, L. A. (2004). Mental health histories and psychiatric medication usage among persons who sought cosmetic surgery. *Plastic and Reconstructive Surgery*, *114*, 1927–1933.

Springer, I. N., Wannicke, B., Warnke, P. H., Zernial, O., Wiltfang, J., Russo, P. A., . . . Wolfart, S. (2007). Facial attractiveness: Visual impact of symmetry increases significantly towards the midline. *Annals of Plastic Surgery*, *59*, 156–162.

Thornhill, R., & Gangestad, S. W. (1993). Human facial beauty: Averageness, symmetry, and parasite resistance. *Human Nature*, *4*, 237–269.

Thornhill, R., & Gangestad, S. W. (1999). Facial attractiveness. *Trends in Cognitive Sciences*, *3*, 452–460.

Walker-Smith, G. J., Gale, A. G., & Findlay, J. M. (1977). Eye movement strategies involved in face perception. *Perception*, *6*, 313–326.

Watson, P. J., & Thornhill, R. (1994). Fluctuating asymmetry and sexual selection. *Trends in Ecology & Evolution*, *9*, 21–25.

Appendix

Demographic Information Sheet

- Age: ……………..

- Gender: Male   Female

- Marital status: Married   Single   Divorce

- Have you ever sought psychiatric treatment?   Yes   No

  - If yes, for what purpose? ………………………………

- Have you ever had a rhinoplasty?   Yes   No

  - If yes, when? …………………………….

- Have you ever had an aesthetic operation other than rhinoplasty?

  - If yes, what kind and when? ……………………………..
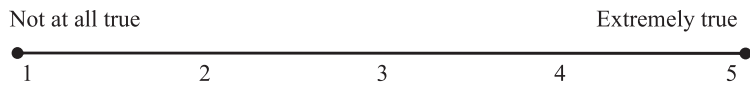
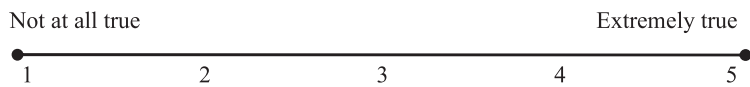**Subjective Nasal Shape Evaluation Scale**

Please rate the shape of your nose.

Very bad   Wonderful

0   1   2   3   4   5   6   7   8   9   10
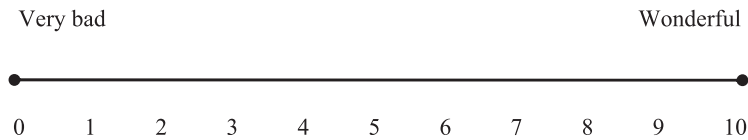
Somatosensory Amplification Scale

1. When Someone Else coughs, it makes me cough too

Not at all true   Extremely true

1   2   3   4   5

2. I can't stand smoke, smog, or pollutants in the air

Not at all true   Extremely true

1   2   3   4   5

3. I am often aware of various things happening within my body

Not at all true   Extremely true

1   2   3   4   5

4. When I bruise myself, it stays noticeable for a long time

Not at all true   Extremely true

1   2   3   4   5

5. Sudden loud noises really bother me

Not at all true   Extremely true

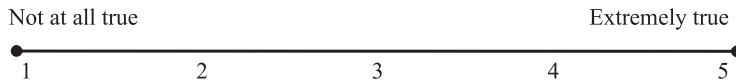1   2   3   4   5

6. I can sometimes hear my pulse or my heartbeat throbbing in my ear

Not at all true   Extremely true

1   2   3   4   5

7. I hate to be too hot or too cold

Not at all true   Extremely true

1   2   3   4   5

8. I am quick to sense the hunger contractions in my stomach

    Not at all true   Extremely true
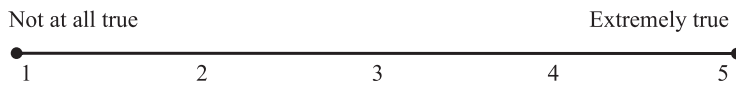
    1   2   3   4   5

9. Even something minor, like an insect bite or a splinter, really bothers me

    Not at all true   Extremely true

    1   2   3   4   5

10. I have a low tolerance for pain

    Not at all true   Extremely true

    1   2   3   4   5
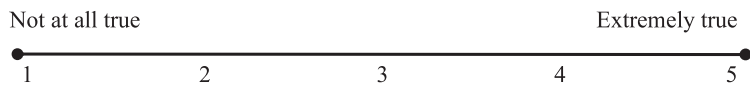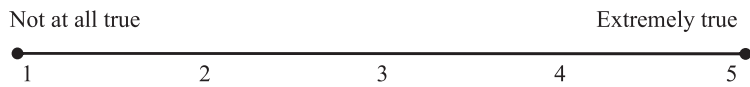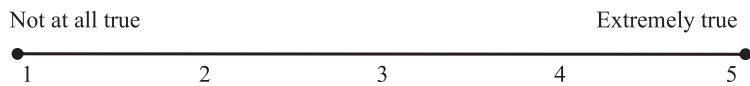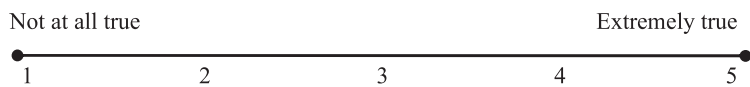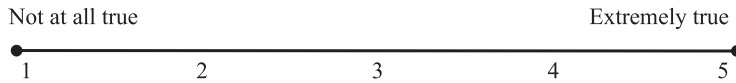
Rhinoplasty Outcome Evaluation

1. How much do you like the appearance of your nose?

    Absolutely no (0), A little (1), More or less (2), Very much (3), Absolutely yes (4)

2. How much can you breathe through the nose?

    Absolutely no (0), A little (1), More or less (2), Very much (3), Absolutely yes (4)

3. How much do you think your friends and acquaintances like your nose?

    Absolutely no (0), A little (1), More or less (2), Very much (3), Absolutely yes (4)

4. Do you thing the appearance of your nose limit your professional or social activities?

    Absolutely no (0), A little (1), More or less (2), Very much (3), Absolutely yes (4)

5. How much confident are you that your nose has the best possible appearance?

    Absolutely no (0), A little (1), More or less (2), Very much (3), Absolutely yes (4)

6. Would you like to change the appearance or the function of your nose with surgery?

    Absolutely no (0), A little (1), More or less (2), Very much (3), Absolutely yes (4)