Original Article

Attractiveness of Modified Photographs of Class II, Division I Patients as Judged by Laypeople and Orthodontists

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Abstract

Background: There are two treatment alternatives that are commonly proposed to class II, division I patients, including camouflage and orthognathic surgeries.

Methods: The original profile photos of two male and two female patients were altered with Photoshop in order to simulate camouflage and surgical treatment. This was performed by increasing the nasolabial angle by 4 mm, 8 mm, and 12 mm and extending the chin-neck length by 3 mm, 6 mm, and 9 mm. The initial and actual final photos of the patient, along with the six modified pictures, were presented to the participants. They reordered the pictures from the most aesthetic to the least aesthetic.

Results: Overall, 30 orthodontists and 140 laypeople completed the task. Orthodontists perceived surgical treatment as more attractive compared to laypeople. The highest rank was assigned to post-treatment photographs of the patients, while the lowest rank was given to pre-treatment photographs.

Conclusion: Class II treatment adds to profile attractiveness as judged by laypeople and orthodontists. There are some differences in opinions between these groups.

Keywords: Laypeople, Profile attractiveness, Malocclusion angle class II, Esthetics dental

Background

The face is the center of attention, and it is believed that people with more attractive faces are more socially accepted and adored. They are also regarded as more intelligent and are more successful in job interviews (1,2). Skeletal malocclusion, defined as a disproportion between jaw position or size, negatively affects facial attractiveness, and this is the main reason people seek orthodontic treatment (3).

Class II, division I malocclusion, characterized by a large overjet, is one of the more prevalent subgroups witnessed in society. Some common facial features are reduced chin projection, retruded lower lip, convex profile, and short chin-neck length, which could impair facial beauty (4).

Two main treatment options are considered for class II, div I malocclusions; they are orthodontic camouflage by the extraction of two maxillary premolars, which might alter the nasolabial angle and upper lip position, as well as orthognathic surgery, which repositions jaws to achieve facial harmony. Mandibular advancement is the main surgical procedure performed, and this surgery often increases chin-neck length. All treatment modalities aim to enhance facial esthetics and affect profile, teeth, chin position, and lip posture (5).

There is no consensus on the best treatment alternative for class II, division I patients that will bring the best esthetic results. Esthetic perception is a subjective concept; thus, we decided to survey and compare the profile attractiveness of these treatment modalities. To the best of our knowledge, few studies have investigated this topic.

Methods

For this study, we modified the initial photographs of two male and two female patients who all had class II, division I malocclusion, with normal facial height and Frankfort–mandibular plane angle. Patients who had a history of rhinoplasty or other cosmetic procedures on affected areas and those with severe mandibular deficiency were

excluded from the investigation. The samples were treated with either camouflage or orthognathic surgery. All image alterations were performed by Adobe Photoshop 22.0 on the original profile photographs of patients.

To simulate mandibular advancement, the chin-neck length, measured on patients' cephalograms, was increased by 3 mm, 6 mm, and 9 mm.

To create camouflage simulations, the measured nasolabial angle was increased by four, eight, and 12 degrees.

All altered images (N = 6) were finalized and prepared for presentation, along with initial and final orthodontic photographs (Figures 1-4).

An online questionnaire was regulated and uploaded, including five tabs. The first tab collected data about the age, gender, and profession of the electorate. The four remaining tabs, each consisting of eight profile photos of the patients, namely, the original initial photograph, six modified, and one final result of the actual treatment performed for the patient, requested the respondents to rank profile photos from most attractive to least attractive.

The respondents were either 18-60-year-old orthodontists or laypeople with academic degrees not associated with the dental profession.

To detect a 0.2 difference between orthodontists and laypeople's responses, considering a power of 90%, at least
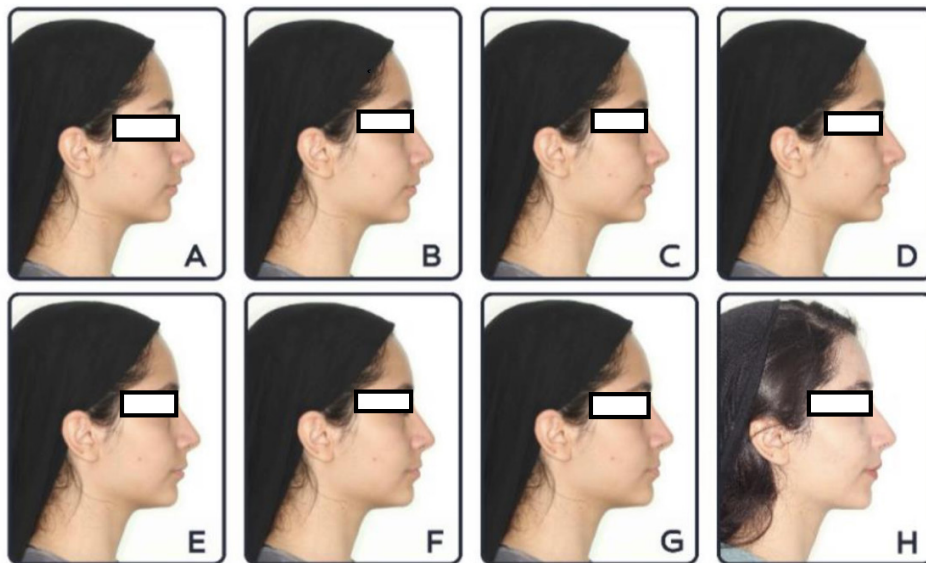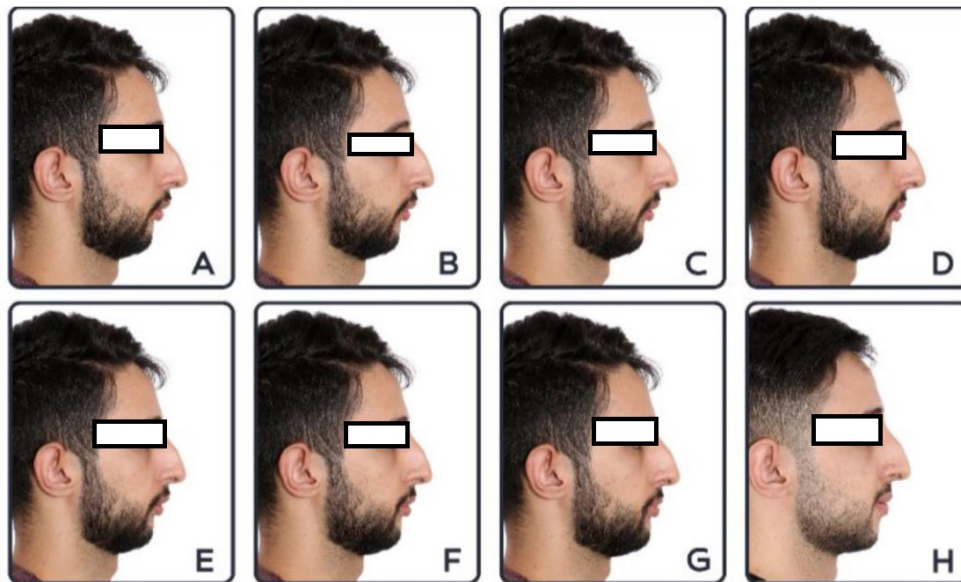

Figure 1. Original Initial (A), Modified (B-G), and Original Final Photographs of Patient 1 [B: Nasolabial Angle Increased by 4 Degrees, C: Nasolabial Angle Increased by 8 Degrees, D: Nasolabial Angle Increased by 12 Degrees, E: Chin-neck Length Increased by 3 mm, F: Chin-neck Length Increased by 6 mm, and G: Chin-neck Length Increased by 9 mm]

Figure 2. Original Initial (A), Modified (B-G), and Original Final Photographs of Patient 2 [B: Nasolabial Angle Increased by 4 Degrees, C: Nasolabial Angle Increased by 8 Degrees, D: Nasolabial Angle Increased by 12 Degrees, E: Chin-neck Length Increased by 3 mm, F: Chin-neck Length Increased by 6 mm, and G: Chin-neck Length Increased by 9 mm]

Figure 3. Original Initial (A), Modified (B-G), and Original Final Photographs of Patient 3 [B: Nasolabial Angle Increased by 4 Degrees, C: Nasolabial Angle Increased by 8 Degrees, D: Nasolabial Angle Increased by 12 Degrees, E: Chin-neck Length Increased by 3 mm, F: Chin-neck Length Increased by 6 mm, and G: Chin-neck Length Increased by 9 mm]

Figure 4. Original Initial (A), Modified (B-G), and Original Final Photographs of Patient 4 [B: Nasolabial Angle Increased by 4 Degrees, C: Nasolabial Angle Increased by 8 Degrees, D: Nasolabial Angle Increased by 12 Degrees, E: Chin-neck Length Increased by 3 mm, F: Chin-neck Length Increased by 6 mm, and G: Chin-neck Length Increased by 9 mm]

140 laypeople and 30 orthodontists had to complete the questionnaires.

The data were analyzed with SPSS software, version 22.0. Chi-square, Kruskal-Wallis, Mann–Whitney, and Freidman tests were employed, and a significance level was kept at 0.05.

Results

A total of 140 laypeople and 30 orthodontists participated in this study. Their age ranged from 18 to 62, and their mean age was 30 years old.

For the first patient, laypeople considered profile H as the most attractive one, while orthodontists preferred profile F. Both groups scored A as the least attractive profile. Table 1 summarizes the mean score of each profile for patient 1.

There was a significant difference between laypeople and orthodontists' scores for profiles E, F, G, and H.

For patient two, laypeople judged H as the most attractive, and orthodontists chose G. Both groups judged A as the least attractive (Table 2). Orthodontists significantly assigned higher and lower scores to surgical treatments (F and G) and camouflage (B and H), respectively.

For the first and second patients, for whom camouflage treatment was completed, the simulated profile of the camouflage treatment was ranked lower in comparison to

Table 1. Mean Ranks Assigned by Two Groups to Photo Set 1

	Group	Mean Rank ± SD	P Value
1A	Laypeople	3.78 ± 2.43	0.119
	Orthodontists	2.97 ± 1.87	
1B	Laypeople	4.18 ± 1.97	0.509
	Orthodontists	3.90 ± 1.75	
1C	Laypeople	4.23 ± 1.98	0.582
	Orthodontists	3.97 ± 1.56	
1D	Laypeople	4.18 ± 2.01	0.328
	Orthodontists	3.77 ± 2.10	
1E	Laypeople	4.62 ± 1.69	0.008
	Orthodontists	5.55 ± 1.67	
1F	Laypeople	4.44 ± 1.98	0.000
	Orthodontists	5.94 ± 2.30	
1G	Laypeople	4.01 ± 2.50	0.042
	Orthodontists	5.06 ± 2.82	
1H	Laypeople	6.55 ± 2.45	0.000
	Orthodontists	4.84 ± 2.54	

Note. SD: Standard deviation.u

Table 2. Mean Ranks Assigned by Two Groups to Photo Set 2

	Group	Mean Rank ± SD	P Value
2A	Laypeople	3.00 ± 2.43	0.102
	Orthodontists	1.97 ± 1.44	
2B	Laypeople	3.44 ± 1.85	0.014
	Orthodontists	2.52 ± 1.23	
2C	Laypeople	3.76 ± 1.55	0.482
	Orthodontists	3.48 ± 1.38	
2D	Laypeople	4.08 ± 1.55	0.628
	Orthodontists	4.23 ± 1.35	
2E	Laypeople	4.70 ± 1.80	0.697
	Orthodontists	4.81 ± 1.57	
2F	Laypeople	4.94 ± 1.89	0.000
	Orthodontists	6.16 ± 1.55	
2G	Laypeople	5.16 ± 2.40	0.000
	Orthodontists	6.61 ± 1.82	
2H	Laypeople	6.97 ± 2.13	0.014
	Orthodontists	6.16 ± 2.35	

Note. SD: Standard deviation.

Table 3. Mean Ranks Assigned by Two Groups to Photo Set 3

	Group	Mean Rank ± SD	P Value
3A	Laypeople	2.52 ± 2.18	0.004
	Orthodontists	1.29 ± 6.93	
3B	Laypeople	3.23 ± 1.84	0.024
	Orthodontists	2.29 ± 6.43	
3C	Laypeople	3.80 ± 1.55	0.083
	Orthodontists	3.32 ± 1.04	
3D	Laypeople	4.28 ± 1.75	0.456
	Orthodontists	4.35 ± 1.17	
3E	Laypeople	4.16 ± 1.55	0.761
	Orthodontists	4.29 ± 1.29	
3F	Laypeople	5.21 ± 1.69	0.005
	Orthodontists	6.16 ± .79	
3G	Laypeople	5.46 ± 2.21	0.001
	Orthodontists	6.71 ± 1.52	
3H	Laypeople	7.28 ± 1.76	0.360
	Orthodontists	7.55 ± .723	

Note. SD: Standard deviation.

Table 4. Mean Ranks Assigned by Two Groups to Photo Set 4

	Group	Mean Rank ± SD	P Value
4A	Laypeople	2.55 ± 2.33	0.102
	Orthodontists	1.39 ± .98	
4B	Laypeople	3.48 ± .1.77	0.014
	Orthodontists	2.16 ± .53	
4C	Laypeople	3.70 ± 1.57	0.482
	Orthodontists	3.16 ± .96	
4D	Laypeople	4.18 ± 1.52	0.628
	Orthodontists	3.94 ± 1.18	
4E	Laypeople	4.40 ± 1.59	0.697
	Orthodontists	4.58 ± .92	
4F	Laypeople	5.17 ± 1.72	0.000
	Orthodontists	5.94 ± .68	
4G	Laypeople	5.40 ± 2.29	0.000
	Orthodontists	7.06 ± .51	
4H	Laypeople	7.06 ± 2.12	0.014
	Orthodontists	7.77 ± .56	

Note. SD: Standard deviation.

the actual result of treatment (H).

Reviewing the scores for the third patient, it was revealed that both groups judged H as the most attractive profile and A as the least attractive one (Table 3). For profiles A, B, F, and G, the scores of the two groups differed significantly. Orthodontists preferred G and H and assigned lower scores to A and B.

Based on the results (Table 4), for both groups, the highest and lowest scores were assigned to profiles H and A, respectively. There was a significant difference between the two groups for profiles A, B, G, and F, as laypeople judged A and B more attractive and G and F less attractive compared to the orthodontists.

For the third and fourth patients who underwent surgical advancement of the mandible, the final treatment outcome was shown to be more attractive than the predicted surgical results.

Discussion

Enhanced esthetics is the main reason people seek orthodontic treatment (2). The ideal of beauty is defined by culture, fashion, and media (6). There is a continuous need to assess the esthetic impact of facial characteristics that are affected during orthodontic treatment alternatives and more attractive facial traits; otherwise, patients may be dissatisfied with the result of their treatment even though

function has improved (7), which is considered a failure. The current study compared the esthetic results of the two treatment alternatives for adult class II, Div. I patients and assessed the impacts of different amounts of mandibular advancement, incisor retraction, and nasolabial angle increase. The profile photographs were modified, and the patient's profile was simulated for different treatments. In addition, the assessors were asked to rank the profile photographs from most to least attractive. In contrast to some studies (8,9), in this study, profile photographs of female and male patients were simultaneously used, and thus it was possible to find out whether gender affects the esthetic results.

In line with several studies (10,11), the findings of our study demonstrated that laypeople and orthodontists both prefer treatment over no treatment; this was true regardless of the gender and actual treatment of the patients.

An interesting finding in this study was that, in all cases, the actual treatment performed on the patient was more attractive than the predicted profile photographs of possible treatments. This is because real-life profile photographs are more appealing than pictures of artificial alterations made by software. Further, the final photograph of patients was taken for a minimum of 2 years after the first photographs; this elucidates the finding that there is soft tissue improvement with growth with time, increasing the effect of the treatment (12).

Laypeople rated surgical treatment in the second, which is in line with the results of other studies that reported that increasing the chin-neck length is more attractive than increasing the nasolabial angle, which indicates camouflage (13).

As orthodontic literature is replete with the concept of an ideal straight profile, orthodontists also prefer surgical treatment, which is consistent with the results of a study that concludes orthodontists rate profiles with a protrusive mandible as highly attractive (14). The preferred amount of mandibular advancement was 9 mm for 3 patients, which conforms to the findings of Kalin et al (10) and Yüksel et al (13). In contrast, 6 mm was preferred for one of the patients, which corroborates the results of Imani et al (14).

Regarding the nasolabial angle change in camouflage treatment, there is controversial evidence. In the study by Imani et al (14), increasing the angle could proportionally add to profile attractiveness. In our study, in three cases, increasing the angle by 12 degrees was considered the most attractive, while in one case, in a female patient with extraction treatment, an eight-degree increase was more attractive than four and twelve degrees, which matches the results of the study by Taghavi et al (15).

For the two patients with mandibular advancement, both groups agreed that increasing the nasolabial angle enhanced profile esthetics, and increasing the amount of advancement was associated with higher esthetic ranks. In addition, 9-mm advancement was judged the most appreciated profile, and, similar to the study by Rocha et al, orthodontists assigned higher ranks to surgical treatment (9).

There was a difference in esthetic scores between male and female patients, and both assessors preferred 9-mm advancement and a 12-degree increase in the nasolabial angle for the male patient, while for the female patient, orthodontists considered 6-mm advancement the most esthetic change, and laypeople preferred a 3-mm advancement.

Conclusion

Based on the findings, either modality of class II treatment adds to profile attractiveness as judged by laypeople and orthodontists. There are some differences in opinion between these groups. It is important to study these differences and the specific patient characteristics and apply the best treatment.

Authors' Contribution
Conceptualization: Homa Farhadifard.
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Formal analysis: Maryam Farhadian.
Funding acquisition: Homa Farhadifard, Vahid Mollabashi, Haniyeh Jalili Khradmand.
Investigation: Haniyeh Jalili Khradmand, Homa Farhadifard, Vahid Mollabashi.
Methodology: Homa Farhadifard, Vahid Mollabashi.
Project administration: Homa Farhadifard, Vahid Mollabashi.
Resources: Maryam Farhadian.
Software: Homa Farhadifard, Vahid Mollabashi.
Supervision: Haniyeh Jalili Khradmand, Maryam Salehzadeh.
Validation: Maryam Farhadian.
Visualization: Homa Farhadifard, Vahid Mollabashi, Marym Salehzadeh.
Writing–original draft: Homa Farhadifard, Vahid Mollabashi, Marym Salehzadeh.

Competing Interests
The authors declare that they have no conflict of interests.

Ethical Approval
This study was approved by the Ethics Committee of Hamadan University of Medical Sciences with the ethics code IR.UMSHA. REC.1400.779. All participants signed consent forms indicating that their photographs would be presented to the study population, and the eyes of the patients were covered to keep their identity confidential.

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