AN EVALUATION OF LIP ATTRACTIVENESS

Konstantinos Kazanis, D.D.S.

An Abstract Presented to the Graduate Faculty of Saint Louis University in Partial Fulfillment of the Requirements for the Degree of Master of Science in Dentistry

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Abstract

Introduction: An essential characteristic of the face and a key to facial beauty are the lips. Many studies have taken place in the past in order to measure lip characteristics, lip position, and define some ideal norms as perceived by lay people or professionals. It appears that fuller lips are currently associated with beauty. Purpose: To determine how lip protrusion affects facial beauty. Subjects and methods: The lips position of four human models was manipulated forward in a graded fashion. Manipulation of the lips was done by placing layers of wax underneath the models’ lips in seven different combinations. Facial photographs of the models were taken from five different angles. Seventy-three judges were asked to rate these photographs based on lip attractiveness using a visual analogue scale. Results: The interclass correlation and the reliability statistics showed that all judges rated similarly only for lip fullness positions 5, 6 and 7 of all the photographs of all the models. Cronbach’s Alpha was 0.754, 0.762 and 0.762 for lip fullness positions 5, 6 and 7 respectively. That means that the pictures in which the models had their lip position modified to the most protrusive among the seven different combinations were evaluated similarly on the horizontal scale by all judges. These values tended to be close to the middle and towards the left end “Not attractive” on the horizontal scale. In order to eliminate the variability of the visual analogue scale scores among the judges, raw scores were transformed to Z-scores. Z-score analysis showed that the lip thicknesses 1, 2, 3 and 4 were rated similarly by all judges as more attractive compared to the lip thicknesses 5, 6 and 7 and that the latter were rated as less attractive as a whole. Conclusions: Judges seem to rate the lips of the models as less attractive as they become progressively fuller. All subjects agreed on the evaluation of the most
protrusive position the lips and their mean score on a visual analogue scale from 0 to 100, was below 50 towards the “Not Attractive” side.
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2012
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Associate Clinical Professor Donald R. Oliver
DEDICATION

To my family, teachers and friends for their genuine help, encouragement and invaluable advice all these years.
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CHAPTER 1: INTRODUCTION

The face is the most expressive part of human body and the one that is prominent in everyday social interaction. The shape and the color of the eyes, the shape of the nose and the lips as well as the facial expressions, all contribute to what we call facial beauty. Facial appearance undoubtedly has an impact on a person’s social life. Modern society places a strong emphasis on attractiveness and particularly facial attractiveness.

An essential feature of facial beauty are the lips and many studies in the past have attempted to evaluate lip esthetics as well as create norms and standards of ideal lip position. There currently appears to be a preference for fuller lips as a judgment of beauty. In an attempt to study the effect of lip fullness on attractiveness as perceived by lay people and orthodontic residents the following study was conducted.
CHAPTER 2: LITERATURE REVIEW

Introduction

Facial appearance undoubtedly has an impact on a person’s social life. Modern society places a strong emphasis on attractiveness and particularly facial attractiveness. There have been many studies in the past that attempted to define norms and ideal proportions for facial beauty as well as to explore how people perceive facial beauty. Specifically, there have been many studies focusing on lip esthetics and how lips are related to other facial structures. It has been shown that people with attractive features are considered as social, more competent, successful and likeable.\(^1\) Also faces with fuller lips are often judged as younger.\(^2\)

Facial Esthetic Standards

Facial beauty as represented for first time in the art in the Egyptian culture approximately 5,000 years ago has changed through the centuries. What was considered beautiful then is different from what was considered beautiful later in Ancient Greece, during the Renaissance era, and now.\(^3\)

Recently, Berneburg et al.\(^4\) in an attempt to investigate changes of facial attractiveness over the past 70 years, observed that the ideal facial profile became more convex in both women and men. Exploring differences between the most popular female and male faces in the past and the present, they also found that the perceived attractiveness of facial profiles might be influenced by societal developments.\(^4\)
Lips

The lips are the key for the lower face. In an attempt to analyze and evaluate the facial soft tissue and the lip position, many studies attempted to develop soft tissue profile norms based on cephalometric analysis of the contour of the facial soft tissue.

Holdaway introduced the harmony line or H-line, a line that is tangent to the soft tissue chin and the upper lip (Figure 2.1). The distance from H line to soft tissue subnasale should be 5 mm ideally with a range of ± 2 mm. Holdaway also measured the superior sulcus depth from a perpendicular to Frankfort horizontal and tangent to the vermillion border of the upper lip and found that 3 mm is ideal with a range of 1 to 4 mm to be acceptable in certain types of faces.

Figure 2.1 H line.

In 1966, Merrifield defined the profile line (Figure 2.2) by drawing a line tangent to the soft-tissue chin and to the most anterior point of either the lower or upper
lip, whichever was most protruding, and extending it upward to Frankfort plane. This reference line was a modification of the H line used by Holdaway. Merrifield also used an angular measurement, the Z angle, formed by the intersection of the profile line and the Frankfort plane. His study concluded that the upper lip should be tangent to the profile line and the lower lip should be tangent or slightly behind it. Moreover with normal FMA, IMPA, FMIA, and ANB measurements in the adult, the normal Z angle is 80 degrees.

Ricketts in his attempt to describe and classify lip relations introduced the esthetic or E plane (Figure 2.3), a line drawn from the nose to the chin and he also stated the “law of lip relationship.” According to this law: “In the normal white person at maturity, the lips are contained within a line from the nose to the chin, the outlines of the lips are smooth in contour, the upper lip is slightly posterior to the lower lip when related to that line, and the mouth can be closed with no strain.” (p 275) According to Ricketts
the lower lip should be positioned 4 mm posterior to the E plane within a range of ±3 mm. He also made a classification of lip imbalance based on how forward the upper and the lower lips were located relative to the E plane. His statements are based more on his clinical experience as there is no sample.

Burstone used another reference plane to study the lip position, the subnasale-pogonion plane (Figure 2.4). According to him, lip protrusion or retraction was measured as a perpendicular linear distance from the subnasale-pogonion plane to the most prominent point on the upper and lower lips. He found that on average the upper lip is 3.5 mm anterior to this line and the lower lip lies 2.2 mm anteriorly in a normal adolescent sample. As a consequence the upper lip should be slightly forward of the lower lip relative to the Sn-Pg line.
Chin and Nose

In a balanced face the lips as part of the lower facial complex, should be in harmony with other facial structures such as the chin and the nose. Thus, ideal lip position is also affected by these facial structures. Czarnecki et al.\(^9\) demonstrated that preference in lip protrusion and retrusion was dependent on the position of the chin and the nose. It is also characteristic that in the attempt to evaluate the preferred lip position in the face, investigators used measurements associated with the E-plane, the profile line, or the Sn-Pg plane all of which include the chin and/or the nose.

According to Coleman et al.\(^10\) mandibular position significantly affects preferred lip position with regard to the profile. By altering the degree of mandibular retrognathism or prognathism in silhouette profiles, they found that fuller lips were preferred for the more extreme retrognathic and prognathic profiles. In contrast, more retrusive lips were preferred for more average profiles. It is interesting that orthodontists, patients, and parents had similar preferences for preferred lip positions in this study. In a similar study Czarnecki et al.\(^9\) they manipulated silhouette profiles of males and females.
and they demonstrated that when a large nose or a large chin is present, more lip protrusion is acceptable for males and females.

According to Peck and Peck\textsuperscript{11} the nose is probably the most commanding feature of overall profile. In contrast De Smit and Dermaut\textsuperscript{12} demonstrated that changes in the dorsum of the nose in profile silhouettes have no influence on the preference value among people with and without an orthodontic background. Nanda and Ghosh\textsuperscript{13} in a similar study showed that judgement of both protrusion and retrusion of the lips were dependent on the positions of the chin and the nose.

**Lip Preferences in Different Ethnicities**

It is believed that different races and ethnicities have different esthetic standards. Thus current anthropometric Caucasian measurements should not be applied in other races.\textsuperscript{14}

Wong et al.\textsuperscript{14} studied the lip proportions in three-dimensional models of male and female Caucasian, Chinese and Korean subjects. Their study showed that there are measurable differences between Asian and Caucasian lip morphology and that lip enhancement based on each individual’s anatomy, ethnic background and personal goals can optimize outcomes. Moreover they found that the lips did not contribute as much to facial attractiveness as thought. Earlier, Foster\textsuperscript{2} tried to answer the question: “Do black, oriental or white groups in America have a preference based on their racial differences?” in terms of profile preferences. So in his study he altered a drawn profile in the lip area, and made a series of profiles from “retrusive” to “protrusive.” Then he asked subjects from four different groups (general dentists, art students, orthodontists, black lay people and Chinese lay people) to judge them. In contrast to the previous study, Foster showed
that the diversified groups do seem to share a common esthetic standard regarding the
posture of the lips.

Matzikos\textsuperscript{15} in his study asked Japanese immigrants to judge five different
Japanese profiles. Although the average Japanese norm is slightly bimaxillary protrusive,
he found that orthognathic profile was the most preferred and the next most desirable was
the profile with bimaxillary dentoalveolar retraction.\textsuperscript{16}

\textbf{Orthodontic Treatment and Lip Movements}

According to Proffit\textsuperscript{17} the ultimate goal of the orthodontic treatment is the
achievement of normal soft tissue proportions and adaptations. One of the objectives of
the orthodontic treatment is the enhancement of the facial soft tissue in the lower third of
the face including the lips. On the other hand, the pretreatment facial soft tissues
sometimes determine the options and the limits of an orthodontic treatment plan. Facial
soft tissue and the lips respond in various ways as a result of the dental or skeletal
movements performed during an orthodontic treatment.

As Nanda and Ghosh\textsuperscript{13} mentioned, research into balancing adherent profiles has
indicated that the position of the lips is usually responsive to orthodontic treatment and is
therefore a more critical ingredient in orthodontics diagnosis than the nose or chin. The
latter two can be altered only with surgery. Positioning of anterior teeth can affect lip
profile to balance the facial profile. This concept may have a direct impact on the
extraction and non-extraction decision during treatment planning.

The analysis of soft tissue effects is considered a critical step in orthodontic
decision making. As a basic esthetic guideline, retracting the maxillary incisors tends to
reduce the prominence of the upper lip.\textsuperscript{18} According to Burstone\textsuperscript{8} even in populations
where fuller lips are the usual findings, extremes of lip protrusion are unaesthetic. So when crowding and protrusion exist, extraction of the teeth should be considered so as not to further procline the incisors and increase the fullness of the lips. Also in patients with concave profile and thin lips, proclination of incisors will tend to create fuller lips and thus more attractive faces. In contrast, retraction of teeth in such a face might prematurely age the face as the normal face tends to flatten with age. A curled or everted lower lip is also considered unattractive. This usually occurs when the lower lip is trapped under the maxillary incisors when excessive overjet exists. Burstone\textsuperscript{8} also says that the maxillary incisors should not be retracted to the extent that the inclination of the upper lip to a true vertical line becomes negative (a true vertical line is an imaginary line at the intersection of the philtrum of the lip with the collumella of the nose).

Hershey\textsuperscript{19} studied the response of the perioral soft tissue to retraction of the incisors in a sample of 36 post-adolescent female patients. He concluded that as the amount of incisor retraction increases, the reduction of lip prominence to the adjacent sulcus also increases. Increased amounts of tooth movement tended to produce relatively less prominent lip contour. Moreover, he found that the lower lip’s position in space was less dependent than the other profile points upon the underlying skeleton.

Merrifield\textsuperscript{6} concluded that the upper lip will thicken slightly after retraction of the upper incisors. He found that for 3 mm of retraction of the tip of the upper incisors, 1 mm of thickening of the upper lip will occur. The lower lip also doesn’t thicken but curls backwards as a result of upper anterior retraction.
Holdaway\textsuperscript{5} also stated that in certain cases where the thickness of the upper lip at the vermillion border exceeds 18 mm, when normal thickness is 14 mm, the upper lip changes very little during retraction of upper incisors.

Kasai\textsuperscript{20} also studied the amount of lip retraction when retracting upper incisors in a sample of Japanese women. He found that for 4.3 mm mean retraction of upper incisors, 1.9 mm of upper lip retraction and 2.4 mm of lower lip retraction occurred. He also found that changes in lower lip position are more predictable than those of upper lip. In a similar study Rains and Nanda\textsuperscript{21} in a sample of female patients older than 15 years, the ratio for upper incisor retraction to upper lip retraction was 8:5.

Talass et al.\textsuperscript{22} examined cephalometric records of treated patients. They concluded that with 6.7 mm of maxillary retraction, the upper lip retracts on average 4.3 mm whereas there is no change in the lower lip.

It is clear that a variable response of the upper and lower lips is seen in response to the retraction of incisors.

**Studies on Lip Esthetics**

Hier et al.\textsuperscript{23} examined the preferences for lip position in males and females and compared them with a common orthodontic standard, using computer-animated imaging. Having a sample of 53 subjects of treated and untreated young adults, they created an average male and female face and then they manipulated the upper and lower lip between extreme retrusive and protrusive positions. Then they made a series of images and 53 volunteers judged them. Hier et al.\textsuperscript{23} found that females prefer fuller lips more so than males. Moreover, males and females preferred fuller lips than Ricketts’ standard values.
In a similar study, Czarnecki et al.\textsuperscript{9} created androgynous facial silhouettes and asked 545 professionals to evaluate the constructed profiles with various lips, chin and nose relations. They found that a slightly convex profile was desirable for females and a straighter profile for males. In addition, they found that more lip protrusiveness was acceptable for males and females when they had either a large chin or a large nose. Faces with very recessive chins or extremely convex profiles were considered undesirable.

In agreement with the previous study, Nguyen and Turley\textsuperscript{24} studied profile pictures of Caucasian male models in fashion magazines from 1930 till present and attempted to show changes in the profiles. The results showed that the ideal male profile has changed significantly with time, and there was a trend of increasing lip projection, lip curl, and vermilion display.

Similarly Cox and Van der Linden\textsuperscript{25} again creating silhouettes of male and female young adults, asked 10 orthodontists and 10 lay people to arrange the silhouettes in order of attractiveness, and they found that between evaluators there were no significant differences in judgments. In their study Knight and Keith\textsuperscript{26} concluded also that orthodontists and lay people are in total agreement with regards to the most attractive faces.

De Smit and Dermaut\textsuperscript{12} constructed shadow profile photographs altering the anterioposterior relation of maxilla and mandible and the lips, the nasal dorsum and the lower facial height combined with the lower lip. These profiles were ranked regarding personal esthetic preference by 249 graduate dental students. The judges were divided in two groups, those with no orthodontic training and another group that had some
background in orthodontics. De Smit and Dermaut\textsuperscript{12} found that profile preferences were comparable for both sexes. Also, for the majority of the profiles the dorsum changes of the nose had no influence on preference value.

Spyropoulos and Halazonetis,\textsuperscript{27} assessing the contribution of the shape of the soft tissue profile outline on facial attractiveness, created the average soft tissue outline using pretreatment facial photographs of 20 females. Then they used computer warping methods to modify the photographs based on the average outline profile. Judges from different groups, orthodontists and laypersons, were asked to score facial attractiveness. As a result, orthodontists tended to give different responses than lay persons even though both agreed rather well on attractiveness rating overall and that profile outline improvement resulted in increased attractiveness scores. They also concluded that other factors also may contribute more significantly to facial esthetics than the profile outline.

There is apparently a trend for fuller lips in males and females. Bisson and Grobbelaar\textsuperscript{28} in a study comparing scanned frontal pictures from models and nonmodels, found that fuller lips are considered more attractive. This is in agreement with Peck and Peck\textsuperscript{3} study. Peck and Peck\textsuperscript{3} took cephalometric x-rays and photographs from models and people noted for their facial attractiveness and they compared them with standard means. They concluded that esthetic Caucasian face had fuller lips than normal and that lay people prefer a fuller and more protrusive dentofacial pattern than the norms. Other studies also show that at this time males with convex profiles and fuller lips are considered attractive.\textsuperscript{24} Foster\textsuperscript{2} also conducted a study whereby faces with various degrees of lip fullness were categorized into groups of perceived age. He found that those faces with fuller lips were judged as younger.
Summary and Statement of Thesis

Through the years it has become clear that beauty, attractiveness and youthfulness have a critical impact on our lifestyle. The face is the most expressive and most exposed part of the human body and a major contributor to appearance. An essential characteristic of the face and a key to facial beauty are the lips.

Many studies have taken place in the past in order to measure lip characteristics, lip position, and define some norms as perceived by lay people or professionals. It appears that fuller lips are currently a considerable component of beauty.

In an attempt to measure the attractiveness of the fullness of the lips and how it is perceived the following study is being conducted.
References


CHAPTER 3: JOURNAL ARTICLE

Abstract

Introduction: An essential characteristic of the face and a key to facial beauty are the lips. Many studies have taken place in the past in order to measure lip characteristics, lip position, and define some ideal norms as perceived by lay people or professionals. It appears that fuller lips are currently associated with beauty. Purpose: To determine how lip protrusion affects facial beauty. Subjects and methods: The lips position of four human models was manipulated forward in a graded fashion. Manipulation of the lips was done by placing layers of wax underneath the models’ lips in seven different combinations. Facial photographs of the models were taken from five different angles. Seventy-three judges were asked to rate these photographs based on lip attractiveness using a visual analogue scale. Results: The interclass correlation and the reliability statistics showed that all judges rated similarly only for lip fullness positions 5, 6 and 7 of all the photographs of all the models. Cronbach’s Alpha was 0.754, 0.762 and 0.762 for lip fullness positions 5, 6 and 7 respectively. That means that the pictures in which the models had their lip position modified to the most protrusive among the seven different combinations were evaluated similarly on the horizontal scale by all judges. These values tended to be close to the middle and towards the left end “Not attractive” on the horizontal scale. In order to eliminate the variability of the visual analogue scale scores among the judges, raw scores were transformed to Z-scores. Z-score analysis showed that the lip thicknesses 1, 2, 3 and 4 were rated similarly by all judges as more attractive compared to the lip thicknesses 5, 6 and 7 and that the latter were rated as less attractive as a whole. Conclusions: Judges seem to rate the lips of the models as less attractive as
they become progressively fuller. All subjects agreed on the evaluation of the most protrusive position the lips and their mean score on a visual analogue scale from 0 to 100, was below 50 towards the “Not Attractive” side.

**Introduction**

Through the years it has become clear that beauty, attractiveness and youthfulness have a critical impact on our lifestyle. The face as the most expressive and most exposed part of the human body is a major contributor to someone’s appearance. An essential characteristic of the face and a key to facial beauty are the lips.\(^1\)

Many studies have taken place in the past in order to measure the lip characteristics, lip position and define some ideal norms as perceived by lay people or professionals.\(^1-18\) It appears that fuller lips are currently associated with beauty.\(^7-21\) Ideal lip position is affected by facial structures such as the chin and the nose\(^8-10,12\) as well as by the racial background of the judges.\(^2,13-14\) Many studies have shown that retraction of the anterior teeth during orthodontic treatment is related to facial soft tissue changes and reduction of lip prominence, something that should be a consideration during treatment planning.\(^4,5,7,22-25\)

In an attempt to measure the attractiveness of the fullness of the lips as perceived by other people the following study is being conducted.
Subjects and Methods

Research Design

The study was designed to test whether lip fullness affects evaluators’ perception about the most and the least appealing images. Human models were screened in the orthodontic clinic of Saint Louis University on the basis of their facial proportions. The first four individuals (two males and two females) that satisfied the inclusion criteria and signed the authorization for release and use of patient images (Appendix A) continued to the next step of the study. Inclusion criteria for the human models were vertical facial thirds within normal limits, upper and lower lips in harmony, soft tissue profile within normal limits, and ages between 21 and 35 years old.

Seven sets of facial photographs were taken on each model. Each set consisted of five photographs taken from five different angles: right profile, ¾ right profile, frontal view, ¾ left profile and left profile (Figure 3.1). For each set of photographs, the model was asked to put a layer of soft red wax of a premeasured thickness underneath their upper and lower lips, covering the labial and buccal surfaces of their teeth in order to modify their lip position and make their lips look fuller. At the first set of photographs, the model had no wax. For the second set, the model had wax layer of 2 mm thickness placed underneath the upper and lower lips. For the third set, 2 mm wax layer was placed only underneath the upper lip and at the fourth set 2 mm wax layer was placed only underneath the lower lip. At the fifth, sixth and seventh sets, wax of 4 mm thickness were used in the same manner (Figure 3.2). During the photo session the models were asked to have their teeth in contact and their lips closed. The photographs were taken in
the orthodontic clinic of Saint Louis University, using a Canon Rebel XS camera during one visit.

Figure 3.1 Example of a set of photographs of model A from five different angles.

| Set 1 | | Set 2 | | Set 3 | | Set 4 | | Set 5 | | Set 6 | | Set 7 |
|-------|---|-------|---|-------|---|-------|---|-------|---|-------|---|
| ![Set 1](image1.png) | No wax. | ![Set 2](image2.png) | 2mm wax under upper and lower lips. | ![Set 3](image3.png) | 2mm wax under upper lip only. | ![Set 4](image4.png) | 2mm wax under lower lip only. | ![Set 5](image5.png) | 4 mm wax under upper and lower lips. | ![Set 6](image6.png) | 4 mm wax under upper lip only. | ![Set 7](image7.png) | 4 mm wax under lower lip only. |

Lip thickness 1

Lip thickness 2

Lip thickness 3

Lip thickness 4

Lip thickness 5

Lip thickness 6

Lip thickness 7

Figure 3.2 Example of the seven sets of photographs of model A.
Seventy-three people were asked to rate the photographs. The group consisted of 40 orthodontic residents from the Center for Advanced Dental Education at Saint Louis University and 33 individuals from the Saint Louis University medical campus with no dental or orthodontic training. The judges were in a room with a projector and a screen and were asked to rate the photographs projected on the screen based on their lip attractiveness by answering a questionnaire. The judges didn’t have any information in advance on how the lips in the photographs were modified. The photographs were projected to the judges in four Power Point presentations for models A, B, C and D respectively in one session. Each presentation consisted of seven slides as follows:

Slide 1: set of five photographs where the model has no wax under his/her lips.
Slide 2: set of five photographs where the model has 2 mm of wax layer under his/her upper and lower lips.
Slide 3: set of five photographs where the model has 2 mm of wax layer under his/her upper lip only.
Slide 4: set of five photographs where the model has 2 mm of wax layer under his/her lower lip only.
Slide 5: set of five photographs where the model has 4 mm of wax layer under his/her upper and lower lips.
Slide 6: set of five photographs where the model has 4 mm of wax layer under his/her upper lip only.
Slide 7: set of five photographs where the model has 4 mm of wax layer under his/her lower lip only.

The questionnaire had visual analogue scales (VAS) (Figure 3.3) for each set of photographs and the judges were asked to rate these photographs by drawing a single vertical line on the horizontal axis anchored by “Not Attractive” to “Very Attractive.”
Each scale had a consistent length of 100 units. In order to “measure” the VAS scores, a ruler of the same length as the scale was used. The left end “Not Attractive” of the visual analogue scale coincided with the number 0 of the ruler and the right end “Very Attractive” of the visual analogue scale coincided with the number 100 of the ruler. Any point in between the two ends could have any value between 0 and 100. The distance from the left end of each scale to the vertical line that every judge constructed, was measured. This measurement represented the judges’ evaluation on each set of photographs. After data collection was complete, appropriate statistic tests were performed to determine the judges’ perception.

![Visual analogue scale example](https://via.placeholder.com/150)

Figure 3.3 Visual analogue scale example.

### Statistical Analysis

Initially, interclass correlation statistic tests (ICC) as well as reliability statistics (Cronbach’s Alpha) were performed to determine whether there was any agreement on the lip fullness of the individuals among the judges. More specifically, ICCs tested whether the judges that evaluated all the models with a certain lip thickness, had a similar opinion based on the attractiveness of the lips. The same test was performed for all lip thicknesses separately. Interclass correlation describes how strongly units in the same group resemble each other whereas Cronbach’s Alpha is a measure of internal
consistency. ANOVA statistic test was also performed in an attempt to see any differences regarding the lip thickness evaluation among the judges. ANOVA could not be performed in all 73 judges simultaneously, so the judges were divided in two smaller groups of males and females to explore any differences between the two groups. Student’s t-tests also were performed to compare mean values of these groups.

In an attempt to explore possible similarities or differences on how judges evaluated the different lip thicknesses, the concept of pattern profile analysis was also used. This method has been used in medicine as a diagnostic tool to identify differences among patients with syndromes. The main characteristic of this method is the elimination of the existing variability. Selected variables are expressed as Z-scores (standard deviation units) and these scores are compared to norms. Graphical representations of the Z-scores are also used to describe any patterned similarities or differences. In this study in order to eliminate the variability the visual analogue scales scores were transformed to Z-scores. Z-scores for all the judges scores were calculated and used as a numerical indication of any similarity and then graphical representations of Z-scores were made for the same purpose.

Results

The interclass correlation and the reliability statistics showed that all judges rated similarly only the lip fullness 5, 6 and 7 of all the photographs of all the models (Table 3.1). Cronbach’s Alpha was 0.754, 0.762 and 0.762 for lip fullness 5, 6 and 7 respectively (when $8 >$ Cronbach’s Alpha $\geq 7$, internal consistency is acceptable). That means that the pictures where the models had modified their lip position to the most protrusive among
the seven different combinations were evaluated similarly on the horizontal scale by all judges. These values tended to be close to the middle and towards the left end “Not Attractive” on the horizontal scale. In all these three cases, the mean and median values were less than 50 whereas for the first four different lip thicknesses the mean and median values were more than 50 (Table 3.2). This also can be seen in the graphical representation of the means (Figure 3.4) and the trend lines drawn (Figure 3.5).

Table 3.1 Internal consistency

<table>
<thead>
<tr>
<th>Lip Thickness</th>
<th>Cronbach’s Alpha</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lip Thickness 1</td>
<td>0.636</td>
</tr>
<tr>
<td>Lip Thickness 2</td>
<td>0.415</td>
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<tr>
<td>Lip Thickness 3</td>
<td>0.591</td>
</tr>
<tr>
<td>Lip Thickness 4</td>
<td>0.603</td>
</tr>
<tr>
<td>Lip Thickness 5</td>
<td>0.754</td>
</tr>
<tr>
<td>Lip Thickness 6</td>
<td>0.762</td>
</tr>
<tr>
<td>Lip Thickness 7</td>
<td>0.762</td>
</tr>
</tbody>
</table>

Table 3.2 Mean, median and mode values of the visual analogue scale scores for each lip thickness

<table>
<thead>
<tr>
<th>Evaluation of Lip Thickness</th>
<th>Mean</th>
<th>Median</th>
<th>Mode</th>
</tr>
</thead>
<tbody>
<tr>
<td>Evaluation of Lip Thickness 1</td>
<td>59.37</td>
<td>57.5</td>
<td>50</td>
</tr>
<tr>
<td>Evaluation of Lip Thickness 2</td>
<td>56.44</td>
<td>57.5</td>
<td>50</td>
</tr>
<tr>
<td>Evaluation of Lip Thickness 3</td>
<td>58.09</td>
<td>56.25</td>
<td>50</td>
</tr>
<tr>
<td>Evaluation of Lip Thickness 4</td>
<td>56.98</td>
<td>56.25</td>
<td>50</td>
</tr>
<tr>
<td>Evaluation of Lip Thickness 5</td>
<td>45.27</td>
<td>46.25</td>
<td>50</td>
</tr>
<tr>
<td>Evaluation of Lip Thickness 6</td>
<td>47.27</td>
<td>47.5</td>
<td>43.75</td>
</tr>
<tr>
<td>Evaluation of Lip Thickness 7</td>
<td>46.62</td>
<td>47.5</td>
<td>50</td>
</tr>
</tbody>
</table>

Figure 3.4 Mean values of the visual analogue scale scores for each model.
In order to compare the mean score values of the judges for each lip thickness, ANOVA tests were performed. ANOVA tests could not be performed in all 73 judges simultaneously, so for that purpose the judges were divided in two smaller groups of males and females. ANOVA test showed that among the male judges there was significant difference on the scores regarding lip thicknesses 1, 5, 6, 7 (Table 3.3) whereas among the female judges there is significant difference on their scores for all the lip thicknesses (Table 3.4). That means that when the lips were not manipulated as well as when the lips were in their most protrusive position, there was diversity in esthetic perception of the lips among the male judges. For the female judges, it seems that there was no agreement on the scores of the lip attractiveness for all different lip positions.

Table 3.3 ANOVA among the visual analogue scale scores of male judges

<table>
<thead>
<tr>
<th>Lip Thickness</th>
<th>ANOVA</th>
<th>Sum of Squares</th>
<th>df</th>
<th>Mean Square</th>
<th>F</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lip Thickness 1</td>
<td>Between Groups</td>
<td>9939.357</td>
<td>24</td>
<td>414.140</td>
<td>1.936</td>
<td>.016</td>
</tr>
<tr>
<td></td>
<td>Within Groups</td>
<td>16043.396</td>
<td>75</td>
<td>213.912</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>25982.753</td>
<td>99</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lip Thickness 2</td>
<td>Between Groups</td>
<td>6571.819</td>
<td>24</td>
<td>273.826</td>
<td>.973</td>
<td>.510</td>
</tr>
<tr>
<td></td>
<td>Within Groups</td>
<td>21103.753</td>
<td>75</td>
<td>281.383</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>27675.572</td>
<td>99</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Table 3.3 Continued

<table>
<thead>
<tr>
<th>Lip Thickness 3</th>
<th>Sum of Squares</th>
<th>df</th>
<th>Mean Squares</th>
<th>F</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Between Groups</td>
<td>6850.208</td>
<td>24</td>
<td>285.425</td>
<td>1.307</td>
<td>.190</td>
</tr>
<tr>
<td>Within Groups</td>
<td>16384.133</td>
<td>75</td>
<td>218.455</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>23234.341</td>
<td>99</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Lip Thickness 4</th>
<th>Sum of Squares</th>
<th>df</th>
<th>Mean Squares</th>
<th>F</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Between Groups</td>
<td>4224.609</td>
<td>24</td>
<td>176.025</td>
<td>.875</td>
<td>.632</td>
</tr>
<tr>
<td>Within Groups</td>
<td>15085.547</td>
<td>75</td>
<td>201.141</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>19310.156</td>
<td>99</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Lip Thickness 5</th>
<th>Sum of Squares</th>
<th>df</th>
<th>Mean Squares</th>
<th>F</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Between Groups</td>
<td>16798.717</td>
<td>24</td>
<td>699.947</td>
<td>2.888</td>
<td>.000</td>
</tr>
<tr>
<td>Within Groups</td>
<td>18175.684</td>
<td>75</td>
<td>242.342</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>34974.401</td>
<td>99</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Lip Thickness 6</th>
<th>Sum of Squares</th>
<th>df</th>
<th>Mean Squares</th>
<th>F</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Between Groups</td>
<td>14657.134</td>
<td>24</td>
<td>610.714</td>
<td>3.595</td>
<td>.000</td>
</tr>
<tr>
<td>Within Groups</td>
<td>12741.128</td>
<td>75</td>
<td>169.882</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>27398.262</td>
<td>99</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Lip Thickness 7</th>
<th>Sum of Squares</th>
<th>df</th>
<th>Mean Squares</th>
<th>F</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Between Groups</td>
<td>21840.265</td>
<td>24</td>
<td>910.011</td>
<td>3.771</td>
<td>.000</td>
</tr>
<tr>
<td>Within Groups</td>
<td>18100.906</td>
<td>75</td>
<td>241.345</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>39941.171</td>
<td>99</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 3.4 ANOVA among the visual analogue scale scores of female judges

<table>
<thead>
<tr>
<th>Lip Thickness 1</th>
<th>Sum of Squares</th>
<th>df</th>
<th>Mean Square</th>
<th>F</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Between Groups</td>
<td>20062.139</td>
<td>47</td>
<td>426.854</td>
<td>2.812</td>
<td>.000</td>
</tr>
<tr>
<td>Within Groups</td>
<td>21862.453</td>
<td>144</td>
<td>151.823</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>41924.592</td>
<td>191</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Lip Thickness 2</th>
<th>Sum of Squares</th>
<th>df</th>
<th>Mean Square</th>
<th>F</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Between Groups</td>
<td>15718.870</td>
<td>47</td>
<td>334.444</td>
<td>1.846</td>
<td>.003</td>
</tr>
<tr>
<td>Within Groups</td>
<td>26081.880</td>
<td>144</td>
<td>181.124</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>41800.750</td>
<td>191</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Lip Thickness 3</th>
<th>Sum of Squares</th>
<th>df</th>
<th>Mean Square</th>
<th>F</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Between Groups</td>
<td>19436.642</td>
<td>47</td>
<td>413.546</td>
<td>2.706</td>
<td>.000</td>
</tr>
<tr>
<td>Within Groups</td>
<td>22005.564</td>
<td>144</td>
<td>152.816</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>41442.206</td>
<td>191</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Lip Thickness 4</th>
<th>Sum of Squares</th>
<th>df</th>
<th>Mean Square</th>
<th>F</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Between Groups</td>
<td>20204.052</td>
<td>47</td>
<td>429.873</td>
<td>3.551</td>
<td>.000</td>
</tr>
<tr>
<td>Within Groups</td>
<td>17430.554</td>
<td>144</td>
<td>121.046</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>37634.606</td>
<td>191</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Lip Thickness 5</th>
<th>Sum of Squares</th>
<th>df</th>
<th>Mean Square</th>
<th>F</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Between Groups</td>
<td>26355.914</td>
<td>47</td>
<td>560.764</td>
<td>3.313</td>
<td>.000</td>
</tr>
<tr>
<td>Within Groups</td>
<td>24370.359</td>
<td>144</td>
<td>169.239</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>50726.273</td>
<td>191</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Table 3.4 Continued

<table>
<thead>
<tr>
<th>Lip Thickness</th>
<th>Sum of Squares</th>
<th>df</th>
<th>Mean Square</th>
<th>F</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Thickness 6</td>
<td>Between Groups 26493.224</td>
<td>47</td>
<td>563.686</td>
<td>4.206</td>
<td>.000</td>
</tr>
<tr>
<td></td>
<td>Within Groups 19297.922</td>
<td>144</td>
<td>134.013</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Total            45791.146</td>
<td>191</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Thickness 7</td>
<td>Between Groups 27916.187</td>
<td>47</td>
<td>593.961</td>
<td>3.778</td>
<td>.000</td>
</tr>
<tr>
<td></td>
<td>Within Groups 22640.285</td>
<td>144</td>
<td>157.224</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Total            50556.472</td>
<td>191</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Calculations of the means of the visual analogue scale scores of male and female judges showed that both groups tended to rate with lower scores the models with more protrusive lips (Table 3.5). Moreover student’s t-tests that were performed between male and female judges’ mean scores for each lip thickness showed that there was a significant difference between the males and females judges regarding their ratings when evaluating the lip fullness 5, 6 and 7 in all the models (Table 3.6).

Table 3.5 Mean score values of male and female judges

<table>
<thead>
<tr>
<th>Subjects’ gender</th>
<th>N</th>
<th>Mean</th>
<th>Std. Deviation</th>
<th>Std. Error Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lip</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Thickness 1</td>
<td>male</td>
<td>100</td>
<td>60.8355</td>
<td>16.20037</td>
</tr>
<tr>
<td>Lip</td>
<td>female</td>
<td>192</td>
<td>58.6068</td>
<td>14.81555</td>
</tr>
<tr>
<td>Thickness 2</td>
<td>male</td>
<td>100</td>
<td>56.2616</td>
<td>16.71979</td>
</tr>
<tr>
<td>Lip</td>
<td>female</td>
<td>192</td>
<td>56.5467</td>
<td>14.79365</td>
</tr>
<tr>
<td>Thickness 3</td>
<td>male</td>
<td>100</td>
<td>58.8800</td>
<td>15.31961</td>
</tr>
<tr>
<td>Lip</td>
<td>female</td>
<td>192</td>
<td>57.6911</td>
<td>14.73007</td>
</tr>
<tr>
<td>Thickness 4</td>
<td>male</td>
<td>100</td>
<td>56.3750</td>
<td>13.96610</td>
</tr>
<tr>
<td>Lips</td>
<td>female</td>
<td>192</td>
<td>57.2982</td>
<td>14.03709</td>
</tr>
<tr>
<td>Thickness 5</td>
<td>male</td>
<td>100</td>
<td>48.9440</td>
<td>16.29670</td>
</tr>
<tr>
<td>Lip</td>
<td>female</td>
<td>192</td>
<td>43.5782</td>
<td>16.63581</td>
</tr>
<tr>
<td>Thickness 6</td>
<td>male</td>
<td>100</td>
<td>49.1961</td>
<td>15.48368</td>
</tr>
<tr>
<td>Lip</td>
<td>female</td>
<td>192</td>
<td>49.1901</td>
<td>16.26941</td>
</tr>
</tbody>
</table>
Table 3.6 T-test between male and female judges’ scores

<table>
<thead>
<tr>
<th>Lip Thickness</th>
<th>t-test for Equality of Means</th>
<th>95% Confidence Interval of the Difference</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>t</td>
<td>df</td>
</tr>
<tr>
<td>Lip Thickness 1</td>
<td>Equal variances assumed</td>
<td>1.181</td>
</tr>
<tr>
<td></td>
<td>Equal variances not assumed</td>
<td>1.148</td>
</tr>
<tr>
<td>Lip Thickness 2</td>
<td>Equal variances assumed</td>
<td>-1.49</td>
</tr>
<tr>
<td></td>
<td>Equal variances not assumed</td>
<td>-1.44</td>
</tr>
<tr>
<td>Lip Thickness 3</td>
<td>Equal variances assumed</td>
<td>.646</td>
</tr>
<tr>
<td></td>
<td>Equal variances not assumed</td>
<td>.638</td>
</tr>
<tr>
<td>Lip Thickness 4</td>
<td>Equal variances assumed</td>
<td>-.534</td>
</tr>
<tr>
<td></td>
<td>Equal variances not assumed</td>
<td>-.535</td>
</tr>
<tr>
<td>Lip Thickness 5</td>
<td>Equal variances assumed</td>
<td>-5.058</td>
</tr>
<tr>
<td></td>
<td>Equal variances not assumed</td>
<td>-4.837</td>
</tr>
<tr>
<td>Lip Thickness 6</td>
<td>Equal variances assumed</td>
<td>-2.868</td>
</tr>
<tr>
<td></td>
<td>Equal variances not assumed</td>
<td>-2.803</td>
</tr>
<tr>
<td>Lip Thickness 7</td>
<td>Equal variances assumed</td>
<td>-3.443</td>
</tr>
</tbody>
</table>

In an attempt to eliminate the variability and explore possible patterned similarities or differences on how the judges evaluated the lips we used the concept of profile patterns. The Z-scores of all visual analogue scale scores were calculated for each of the four models separately and graphical representations of all Z-scores were drawn (Figure 3.6) to explore similar patterns on evaluations as well as to compare them.
Since large number of plots needed to be compared, Pearson correlation was not indicated due to the large number of variables. A plot of the Z-scores of all the judges for each lip thickness was made (Figure 3.7). In this plot where the variability of the visual analogue scale scores has been eliminated and raw scores have been transformed to Z-scores, it seems that the lip thicknesses 1, 2, 3 and 4 were rated similarly by all judges as more attractive compared to the lip thicknesses 5, 6 and 7 that they were rated as less attractive as a whole.
The results of this study showed that the judges seem to rate the lips of the models as less attractive as they become progressively fuller. Even though Cronbach’s Alpha showed that there is no agreement on the rating of the lip thickness 1, 2, 3 and 4 among the raters, there is a tendency for the judges to score these 4 combinations above 50, towards the “Very Attractive” side. In contrast, lip thickness 5, 6 and 7 were scored below 50 towards the “Not Attractive” side and judges showed statistically significant agreement on that finding (Cronbach’s Alpha >0.7). After running paired Student’s t-tests it was clear that models A, C and D showed a definite trend and pattern on how their lips were rated by the judges. It is also interesting that model B seems to be an outlier that confounded the trends on the other three models. When model B was removed during the statistical analysis, the results were more consistent with the Z-score plot. That can be seen also in figure 3.5. It is apparent that the trend line for model B is much flatter than the trend lines for models A, C and D. As mentioned before the models
were different in terms of facial characteristics, convexity and gender and that might have affected the judges’ ratings.

Numerous studies in the past have shown that fuller lips are considered more attractive in Caucasian males and females\textsuperscript{7-21} and some of them attempted to measure the ideal lip position\textsuperscript{1-18} but there has not been specific information or guidance on the amount and the limits of lip fullness that is still considered attractive. Foster\textsuperscript{2} in his study found that a diversified group of judges do seem to share a common esthetic standard for lip posture within 1-2 mm. Nguyen and Turley\textsuperscript{20} in their study concluded that the linear measurements of the upper and lower lips to E-plane have significantly decreased with time, indicating an increased lip projection trend. Other studies also related the amount of acceptable lip protrusion on other facial structures like the chin and the nose.\textsuperscript{8-10,12} Czarnecki et al.\textsuperscript{8} found that more lip protrusiveness was acceptable for females and males when they had either large chin or large nose in agreement with Nanda and Ghosh\textsuperscript{12} who showed that judgment of protrusion or retrusion of the lips are dependent on the position of the chin and the nose. In this study, when the lips of the models were first manipulated to a slightly more protrusive position than the natural (lip thicknesses 2, 3 and 4) the judges showed variability with regards to whether they liked the fuller lips more than the natural position. Most of them though, rated these lip thicknesses with a score of more than 50 on the visual analogue scale and towards the attractive side. When the lips were manipulated to a more protrusive position than the previous (lip thicknesses 5, 6, and 7) it became apparent that the judges almost in their entirety could identify the not so attractive appearance of the lips compared to the rest of the photographs. This study could not identify the critical numerical value of lip fullness that makes the lips perceived
as not attractive compared to attractive but it is not difficult to estimate that it falls between 2-4 mm. The study showed clearly though that all raters agreed on the extreme unattractive lip protrusiveness.

Several studies in the past have used the concept of modified profile photographs or constructed silhouettes in order to evaluate facial structure changes and how they are perceived by judges. Most of the time the manipulation of the profile was done digitally or by drawing. In this study, the modification of the lips was accomplished by placing a variable amount of wax underneath the models’ lips. This could have created a more realistic modification of the lips compared to a digital manipulation of the facial soft tissue on a photograph. Moreover most of the past studies have used only profile or frontal facial photographs or silhouettes for evaluation. In this study photographs of models from five different angles were used in order to offer to the judges a three dimensional perspective of the facial soft tissue.

Limitations of the study were that the four models did not have the same facial structures and profiles and they were different from each other in terms of convexity, facial characteristics as well as of different genders. As a consequence the subjects’ opinion regarding the lip attractiveness could have been affected by personal preferences, the models’ facial appearance, as well as their gender. In similar studies in the future, investigators should consider using more similar types of faces in order to reduce the variability.
In future studies, it would be interesting to explore more precisely how people perceive lip position changes in different types of faces and relate these facial soft tissue changes to widely used esthetic planes.

Conclusions

Judges rated the lips of the models as less attractive as they became progressively more protrusive. There was a distinctive trend in the rating of the attractiveness of the lips as the lips were altered. All judges agreed on the evaluation of the most protrusive position the lips and their mean score on a visual analogue scale from 0 to 100, was below 50 towards the “Not Attractive” side.

In clinical diagnosis and orthodontic treatment the proclination of the anterior teeth and how such could affect facial esthetics, and more specifically the position of the lips, should be considered. The amount of increase in lip protrusiveness that a reasonable face could tolerate falls between 2 to 4 mm. Further increase of lip fullness during orthodontic treatment could be perceived as unattractive.
Literature Cited


Appendix A

Saint Louis University

Authorization for Release and Use of Patient Image

I hereby authorize Saint Louis University (“University”), or its designee, to:

1. to use my image, including but not limited to, my name, photograph, picture, portrait, digital image, video, likeness, statements and voice (hereinafter collectively known as my “Image”), for the purpose of Health Sciences Center publicity;

2. to use, reproduce, publish, exhibit, distribute and transmit my Image individually or in conjunction with other images or printed matter, including but not limited to video tapes, sound recordings, still photographs, digital reproductions or any other form of media;

3. to record, reproduce, amplify and simulate my Image and all sound effects produced;

4. to assign the above-mentioned rights to third parties.

I hereby waive the right to inspect or approve my Image or any finished materials that incorporate my Image. I understand and agree that I will receive no compensation, now or in the future, in connection with the use of my Image. I understand that the use of my Image by the University may cause my status as a patient of the University and my medical diagnosis to become generally known in the community.

I hereby release and forever discharge the University, its Trustees, officers, agents and employees from any and all claims, demands, rights and causes of action of whatever kind that may arise from the use of my Image, including but not limited to, all claims for defamation and invasion of privacy.

This authorization shall expire at such time as the University no longer uses the Image for Health Sciences Center publicity, unless I specifically revoke my authorization in writing as explained in the University’s notice of privacy statement. I understand that my health care and the payment for my health care will not be affected if I do not sign this form. I understand that federal privacy regulations may no longer protect the use of my Image once the University utilizes my Image.

Name (please print): ___________________________ Date: ________________

Signature: ___________________________ Phone Number: ___________________________

University Representative: ________________________________________________
Appendix B

Survey information

Thank you for participating in this survey. I am conducting a study to determine people’s perception on lip attractiveness.

You will be shown some sets of photographs on the screen from four different persons (A, B, C, D). Please evaluate each set of photographs following the instructions on the survey questionnaire form.

Regards,

Konstantinos Kazanis DDS
Survey questionnaire

You will be shown seven sequential sets of facial photographs of the same person. For each set of photographs, evaluate the lip attractiveness by drawing a vertical line on the horizontal scale from not attractive to very attractive.

Example

Rate lip attractiveness with a single vertical line.

Not attractive very attractive

PERSON (A)

Set 1

Rate lip attractiveness with a single vertical line.

Not attractive very attractive

Set 2

Rate lip attractiveness with a single vertical line.

Not attractive very attractive
Set 3
Rate lip attractiveness with a single vertical line.

Not attractive       very attractive

Set 4
Rate lip attractiveness with a single vertical line.

Not attractive       very attractive

Set 5
Rate lip attractiveness with a single vertical line.

Not attractive       very attractive

Set 6
Rate lip attractiveness with a single vertical line.

Not attractive       very attractive
Set 7
Rate lip attractiveness with a single vertical line.

PERSON (B)

Set 1
Rate lip attractiveness with a single vertical line.

Set 2
Rate lip attractiveness with a single vertical line.

Set 3
Rate lip attractiveness with a single vertical line.
Set 4
Rate lip attractiveness with a single vertical line.

Not attractive  very attractive

Set 5
Rate lip attractiveness with a single vertical line.

Not attractive  very attractive

Set 6
Rate lip attractiveness with a single vertical line.

Not attractive  very attractive

Set 7
Rate lip attractiveness with a single vertical line.

Not attractive  very attractive
PERSON (C)

Set 1
Rate lip attractiveness with a single vertical line.

Not attractive very attractive

Set 2
Rate lip attractiveness with a single vertical line.

Not attractive very attractive

Set 3
Rate lip attractiveness with a single vertical line.

Not attractive very attractive

Set 4
Rate lip attractiveness with a single vertical line.

Not attractive very attractive
Set 5
Rate lip attractiveness with a single vertical line.

Not attractive                     very attractive

Set 6
Rate lip attractiveness with a single vertical line.

Not attractive                     very attractive

Set 7
Rate lip attractiveness with a single vertical line.

Not attractive                     very attractive

PERSON (D)

Set 1
Rate lip attractiveness with a single vertical line.

Not attractive                     very attractive
Set 2
Rate lip attractiveness with a single vertical line.

Not attractive

very attractive

Set 3
Rate lip attractiveness with a single vertical line.

Not attractive

very attractive

Set 4
Rate lip attractiveness with a single vertical line.

Not attractive

very attractive

Set 5
Rate lip attractiveness with a single vertical line.

Not attractive

very attractive
Set 6
Rate lip attractiveness with a single vertical line.

Not attractive    very attractive

Set 7
Rate lip attractiveness with a single vertical line.

Not attractive    very attractive

What is your age?    ____18-25    ____26-33    ____34-41    ____41+
Are you male _     or   female _ ?
Are you _____1\textsuperscript{st}    _____2\textsuperscript{nd} or _____3\textsuperscript{rd} year resident?
Konstantinos Kazanis was born on December 26, 1980 in Athens, Greece. He received his dental education at the Dental School of the University of Athens, Greece and graduated with a degree of Doctor of Dental Surgery in 2006. Immediately after his graduation he did his compulsory military service in the Hellenic Army for a year where he offered dental care to soldiers. In June 2009 he began his graduate orthodontic education at the Center for Advanced Dental Education at Saint Louis University, in St. Louis, Missouri. He is currently a candidate for the degree of Master of Science in Dentistry.