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**GENERATIONAL DIFFERENCES IN PERCEIVED LIP PROTUSION
ESTHETICS**

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A Thesis
Submitted to the Faculty of the
Department of Orthodontics
University of Louisville School of Dentistry
In Partial Fulfillment of the Requirements
For the Degree of

Masters in Oral Biology

August 2011

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ESTHETICS**

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A Thesis Approved on

June 20th, 2011

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DEDICATION

This thesis is dedicated to my family, who has instilled in me the values of education and has given me the love and support I need to follow my dreams. A special thanks to my wife, Briana Butler, for her patience, understanding, and support during this long journey.

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ABSTRACT

GENERATIONAL DIFFERENCES IN PERCEIVED LIP PROTRUSION ESTHETICS

David Butler, DMD

May 24, 2011

Background: Facial esthetics plays a major part in diagnosis and treatment planning in orthodontics. One aspect of facial esthetics that orthodontist can drastically change, for better or worst, is that of lip position. What is considered esthetic, however, may vary from person to person based on a multitude of variables. **Hypothesis:** It is hypothesized that the esthetics of lip protrusion differs with age, with a younger layperson preferring a more protrusive lip position than an older person's ideal lip protrusion. **Methods:** 208 lay people, ages 12+, with no background in the dental field, were surveyed and asked to rank from 1-4 a series of profiles with different lip positions in relation to the E-line, 1 being the most esthetic, 4 being the least esthetic. The respondents were then divided into different age ranges and their responses analyzed. **Results:** The 12-19 age group chose the profile with the lip position on the e-line as most esthetic. Age groups 20-39, 40-59, and 60+ all chose the profile that was 2mm behind e-line as the most esthetic.

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CHAPTER I

INTRODUCTION

A. Introduction

Facial esthetics is a major reason many individuals come to an orthodontist for treatment. Mankind's interest in facial beauty is not a modern phenomenon. Peck and Peck[1] described how mankind's focus on facial esthetics evolved from the Stone age to modern day. They demonstrated that facial beauty was not a stagnant concept, but one that constantly evolved with time. One aspect of facial esthetics that an orthodontist can influence is the protrusiveness of the upper and lower lips. A person's lips position is influenced by the position of the upper and lower incisor. It has been demonstrated that if premolars are extracted and incisors retracted, that the patients lips will retract as well.[2, 3] This alteration in lip protrusion will in effect alter the patient's facial esthetics. Although not the sole determining factor, lip protrusion esthetics plays a major role in whether or not extraction are a necessary part of a patients treatment plan. An orthodontist must predict if the final position of the patient's lips will be considered an esthetic improvement or decline. However, since societies view of facial beauty is constantly changing with time, it would seem appropriate that an orthodontist be familiar with what the current trends in facial esthetics are.

B. Literature Review

The perception of facial beauty has been researched extensively over the years. The form and balance of the face, and how it is perceived, has been a fascination to mankind since the beginning of any human records[1]. The physiognomists of the seventeenth, eighteenth, and early nineteenth centuries studied and wrote about facial esthetics with an enthusiasm far exceeding their scientific resources. They promised to uncover profound personality traits and biologic truths by examining facial features. Some of their crafty conclusions were that the width of the mouth indicated the breadth of the stomach; that the mouth was the coarsest part of the face, being the greatest distance from the brain; that abundant facial folds and dimples labeled a wildly temperamental individual. Furthermore, lip drape and lip protrusion were related to "animal passion": the shorter or more protrusive the lips, the more bestial the person.[4, 5] A 1992 Craniofacial Biology Symposium described Woolnoth's 1865 study on human facial esthetics where he states, "There are three forms of the face seen in the profile view: the straight, the convex, and the concave. The straight face is considered the handsomest and may be detected by drawing a straight line from the top of the forehead to the bottom of the chin without intersecting more than a portion of the nose and a very small part of the upper lip. The convex faces... have this ulterior advantage, that they retain a youthful appearance beyond the natural periods. The concave faces give young persons somewhat of an old fashioned appearance, and most unfortunately bring the face too soon to its maturity... Every feature is in balance with every other feature and all lines are

wholly incompatible with mutilation or malocclusion.”

Goldstein surveyed what facial feature was considered most important to beauty and found that eyes were chosen 34%, the smile 31%, hair 10%, skin color 5%, shape of the nose 5%, and facial proportions as a whole 15%.[6] Because of the great influence the mouth and lower face have on overall facial beauty, the dental field, especially orthodontics, has been a major contributor to facial beauty research. Researchers and clinicians[7, 8] as early as the 1950's began suggesting that the soft tissue profile be considered when planning orthodontic treatment. In order to better evaluate where the lips are positioned, several reference lines have been introduced to assess the anteroposterior position of the upper and lower lip in relationship to the face.

In 1957, Ricketts[8] used what he called the “esthetic plane” or e-plane, which was a line that extended from the tip of the nose to the tip of the chin (figure 1). He concluded that it was a convenient reference line for the analysis of lip position. From clinical observation, he found that the lower lip of adults should be positioned 4 mm posterior to the E-plane +/- 3 mm.[9] For children, he felt the lips should be more full, on average 2 mm posterior to the E-plane +/- 3 mm. Ultimately, Ricketts stressed the importance of balance of the lips relative to the nose and the chin, pointing out that overly protruded or retruded lips were unharmonious and unesthetic.

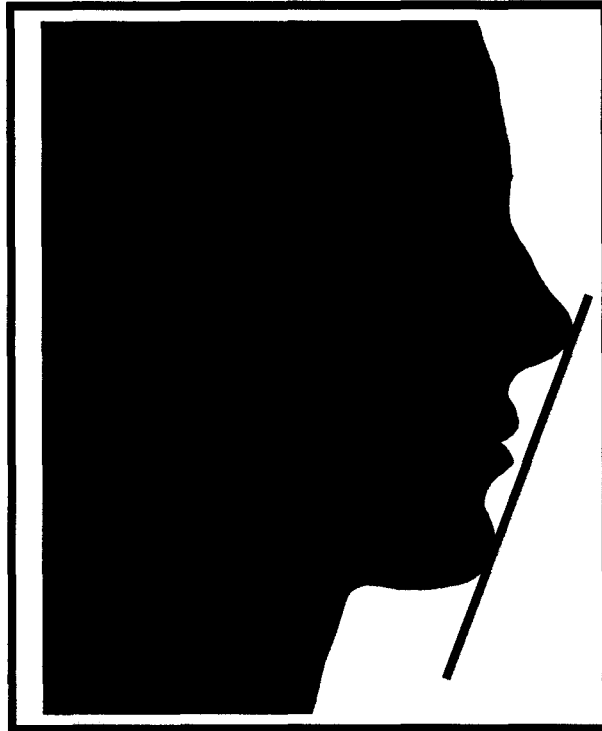


Figure 1. Rickett's E-plane or E-line

Besides Ricketts, a few other researchers and clinicians developed their own reference line. Steiner's lip analysis[10] entailed a line drawn from the center of the S-shaped curve between the tip of the nose and the soft tissue subnasale, to the soft tissue pogonion. Holdaway[11] used a line tangent to the upper lip from the soft tissue pogonion. Burstone[12] took the soft tissue subnasale as the upper point and soft tissue pogonion as the lower point of the reference line. Sushner[13] used a line drawn from the soft tissue nasion to the soft tissue pogonion.

Over the decades since, many studies have sought to evaluate the lip profile, how it changes in response to orthodontics, and what the best lip position is. One of the most significant ways in which an orthodontist can modify the lip protrusion of a patient is by extracting upper and/or lower premolars.

Early research done by Bloom [14] in 1961 found that “the soft-tissue response is closely related to that of the orthodontically moved hard-tissue structures.”

Later, Drobocky [15] found that in patients treated with 4 upper and lower first premolar extractions “the mean changes for the total sample included an increase of 5.2 degrees in the nasolabial angle, and retraction of the upper and lower lips 3.4 and 3.6 mm to the E line, respectively.” Talass [16] similarly found that, in Class II Div I patients, “orthodontic treatment, including an average retraction of the maxillary incisors of 6.7 mm, caused the upper lip to retract by an average of 4.3 mm when changes caused by growth were eliminated.

Concerning the beauty of the lips and how they complement the face, Peck and Peck,[1] in 1970, discovered the public found lip profiles that were consistently more full and protrusive as esthetic than those considered to be ideal by orthodontists. In 2004, Yehezkel and Turley[17] found that the public preference had changed with time and that a more full and convex facial profile for black people was preferred than previously. Foster[18] in 1973 found that laymen chose fuller lip profiles for children than adults. This seemed consistent with other research that found that lip profiles became more retruded with age,[19] and that slightly fuller lips were preferred for women than for men. Czarnecki et al[20] also reported that subjects preferred fuller lips for females, but also found that ideal lip position was closely linked to nose and chin positions; with subjects preferring a more protrusive lip profile with a larger nose and a more forward chin position. Coleman et al[21] found that fuller lip positions were preferred for the more extreme retrognathic and prognathic profiles, but a

more retrusive lip position was preferred for the more average profile. They found this to be the case for teenagers, adults and orthodontist alike. Berneburg completed a study in 2010 to investigate differences between the most popular female and male faces, past and present, and to determine whether they had changed over time. By comparing the images of male and female movie stars since 1940, they found that the women had fuller and more protrusive lip profiles than did the men, particularly during the first decade of the 21st century. During the observation period, female and male faces considered highly attractive became slightly more similar in terms of chin position and size, with the men's faces becoming more convex over time.[22]

C. Significance:

There is limited current literature showing modern views of lip protrusion esthetics, and given the dynamic public interpretation of facial beauty, practitioners are left to go with their own view, or base it off of outdated literature that may not be congruent with current population views. Additionally, little research has demonstrated if variability exists between different age groups as to what is considered esthetic. Classic guidelines, still used today, for what is considered esthetic may not be up-to-date with current trends in population's esthetic perspective. If a more protrusive lip position is found to be esthetic among the younger subjects, the treating orthodontist may need to consider that a younger patient may have a desire to have a fuller profile than the, often older, practitioner may view as esthetic.

D. Purpose:

This study has the following specific aims:

- To determine if there is a preferred profile lip position within a given age range.
- To determine if younger age groups prefer a more protrusive profile compared to older age groups

E. Hypotheses:

Null hypotheses:

1. There is no preferred profile within any age group
2. Younger age groups do not prefer a more protrusive profile compared to older age groups

Alternative hypotheses:

1. There is a preferred profile within any age group
2. Younger age groups prefer a more protrusive profile compared to older age groups

CHAPTER II

METHODS AND MATERIALS

IRB approval was given for the distribution of this survey on Feb 24, 2011.

Tracking # 11.0057

A. Sample:

The sample population was divided into 4 age ranges. Group 1 consisted of individuals ages 12-19. Group 2 consisted of individuals ages 20-39. Group 3 consisted of individuals ages 40-59. Group 4 consisted of individuals ages 60 and above.

B. Inclusion/Exclusion criteria:

In order to best quantitatively analyze this study, research subjects that were selected to complete this study qualified using the following inclusion/exclusion criteria (see figure 1):

1. Subject had to be 12 or older
2. Subject was to have no previous dental training
3. Subject had to complete the survey in its entirety

Please complete the following survey. Completion of this survey is completely voluntary.

Age:

Sex: M F

Do you have any training in the dental profession? Y N

If yes, please explain:

Race/Ethnicity: Caucasian African American Asian Hispanic
Other _____

Figure 2. Inclusion/Exclusion Questions

C. Data collection:

Before participating in this study, all subjects were informed of the subject matter involved in the questionnaire and given written informed consents and survey questionnaire (Appendix B). Subjects for this study were approached in various patient waiting rooms at the University of Louisville School of Dentistry.

A female patient treated at the University of Louisville, with average facial form, nose size, and chin position was selected. The patient also had an average facial convexity. Following the recommendations of Foster[18] and Czarnecki[20] the profile was changed to an androgynous silhouette to reduce the influence of any distracting or sex-defining features, allowing better concentration on lip position. All vertical relationships, as well as nose or chin anterior-posterior position were unaltered, in order to evaluate only the position of

the lips. Using Adobe Photoshop CS5, the anterior-posterior positions of the lips were moved to various protrusions in relation to the e-line. The 4 positions were: 4mm behind e-line, 2mm behind e-line, on e-line, and 2mm ahead of e-line (see figure 3). Participants were then asked to rank the silhouettes 1-4, in order of most attractive to least attractive (1 being most attractive, 4 being least attractive).

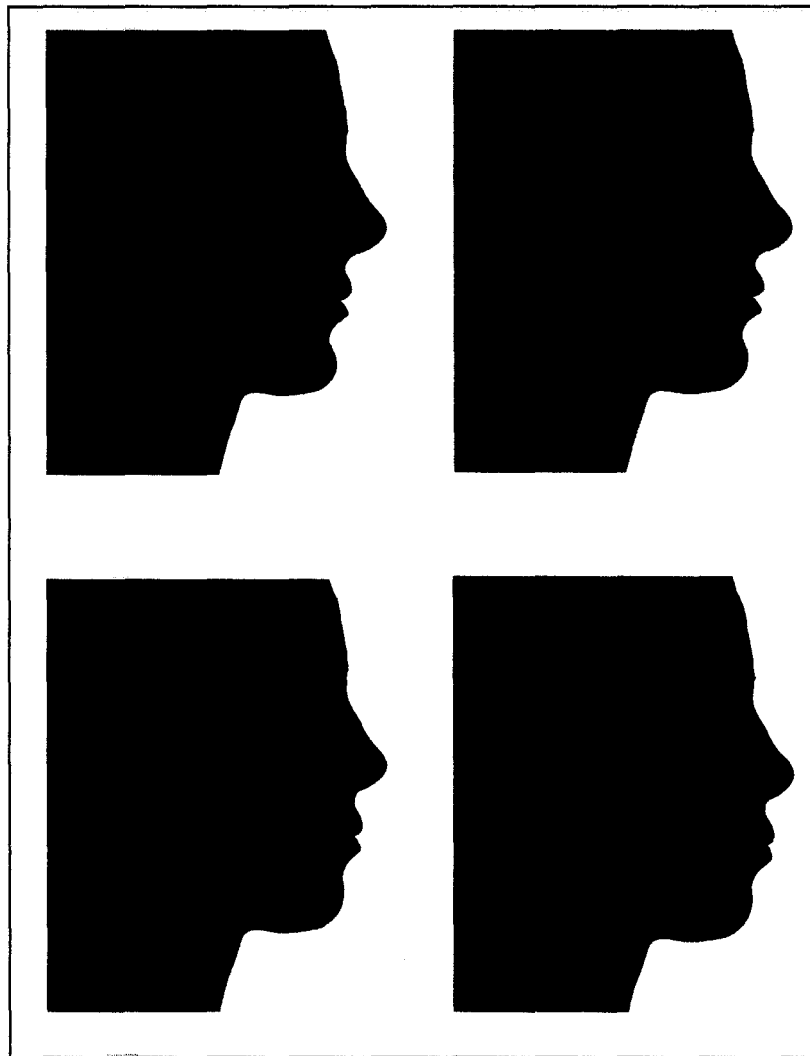


Figure 3: Silhouette Profiles

D. Statistical analysis:

To test for an overall difference of ranked preferences within each age group, the Friedman test was used to account for repeated measures (ranks) within each subject. This was used as the “omnibus” test for each age group.

CHAPTER III

RESULTS

207 evaluators ranging in age from 12-83 participated in this study. 74 were male, 133 were female. The first age group (12-19 years old) had a sample size of 47 (25 males and 22 females). The second age group (20-39 years old) also had 47 subjects – 31 females and 16 males. The third age group (40-59 years old) had a sample size of 67 – 20 males and 47 females. The fourth age group (60+ years old) had a sample size of 46 – 31 females and 15 males (See Table 1). The Friedman test showed that for each age group, there was an overall significant difference in ranked preferences between profiles. Age group three had the most significant difference (lowest overall p-value), possibly because it also had the largest sample size. Individual responses are found in Table 2.

For the age group of 12-19, the profile with the most esthetic (lowest) mean was the profile with the lips positioned on the e-line (p value .048). For the age group 20-39, the profile with the most esthetic mean was the profile with the lips 2mm behind e-line(p value .005). The age group of 40-59 also chose 2mm behind e-line as the most esthetic (p value <.001). -2mm is also what the age group of 60 and above chose (p value .007) (see Table 2, Figure 4). When broken into gender (Table 3, Figure 5) the higher p-values (especially for males in groups 2,3,4) is due to the smaller sample sizes.

Age Group	Total #	# of Males	# of Females
12-19	47	25	22
20-39	47	17	30
40-59	67	17	50
60+	46	15	31
Total	207	74	133

Table 1. Age Group/ Sex Distribution

Table 2: Distribution of Ranked Preferences by Age Group						
Age						Overall
Group	Profiles	Mean	SD	Median	IQR	P-Value
12-19	Minus_4	2.5	1.3	2	3	0.048
	Minus_2	2.4	0.9	3	1	
	Minus_0	2.2	1.0	2	2	
	Plus_2	2.9	1.0	3	2	
20-39	Minus_4	3.0	1.1	3	2	0.005
	Minus_2	2.1	1.0	2	2	
	Minus_0	2.2	1.1	2	2	
	Plus_2	2.6	1.0	3	1	
40-59	Minus_4	2.7	1.0	3	2	<0.001
	Minus_2	2.0	1.1	2	2	
	Minus_0	2.3	1.1	2	2	
	Plus_2	2.9	1.0	3	2	
60+	Minus_4	2.6	1.1	2.5	2	0.007
	Minus_2	2.0	1.1	2	2	
	Minus_0	2.5	1.1	3	1.75	
	Plus_2	2.8	1.0	3	2	
Overall P-Value from Friedman test						

Table 3: Distribution of Ranked Preferences by Age Group and Gender							
Age							Overall
Group	Gender	Profiles	Mean	SD	Median	IQR	P-Value
12-19	F	Minus_4	2.6	1.3	2.5	3	0.286
		Minus_2	2.6	0.9	3	1	
		Minus_0	2.1	0.9	2	1.75	
		Plus_2	2.8	1.2	3	2	
	M	Minus_4	2.4	1.3	2	3	0.169
		Minus_2	2.3	0.9	2	1	
		Minus_0	2.2	1.0	2	2	
		Plus_2	3.0	0.9	3	2	
20-39	F	Minus_4	3.0	1.1	3	2	0.020
		Minus_2	2.1	0.9	2	2	
		Minus_0	2.2	1.2	2	2	
		Plus_2	2.6	1.0	2	1	
	M	Minus_4	2.9	1.1	3	2	0.317
		Minus_2	2.3	1.1	2	2	
		Minus_0	2.2	0.9	2	1.25	
		Plus_2	2.5	1.0	3	1	
40-59	F	Minus_4	2.7	1.1	3	2	0.002
		Minus_2	2.1	1.1	2	2	
		Minus_0	2.1	1.0	2	2	
		Plus_2	3.0	1.0	3	2	
	M	Minus_4	2.8	1.0	3	2	0.057
		Minus_2	1.8	1.0	1	1.25	
		Minus_0	2.6	1.1	3	1.25	
		Plus_2	2.7	1.1	2.5	2	
60+	F	Minus_4	2.5	1.1	2	2	0.021
		Minus_2	2.0	1.1	2	2	
		Minus_0	2.5	1.0	3	1	
		Plus_2	3.0	1.0	3	2	
	M	Minus_4	2.7	1.2	3	2	0.333
		Minus_2	1.9	1.0	2	2	
		Minus_0	2.5	1.3	3	3	
		Plus_2	2.6	1.1	2	1.5	
Overall P-Value from Friedman test							

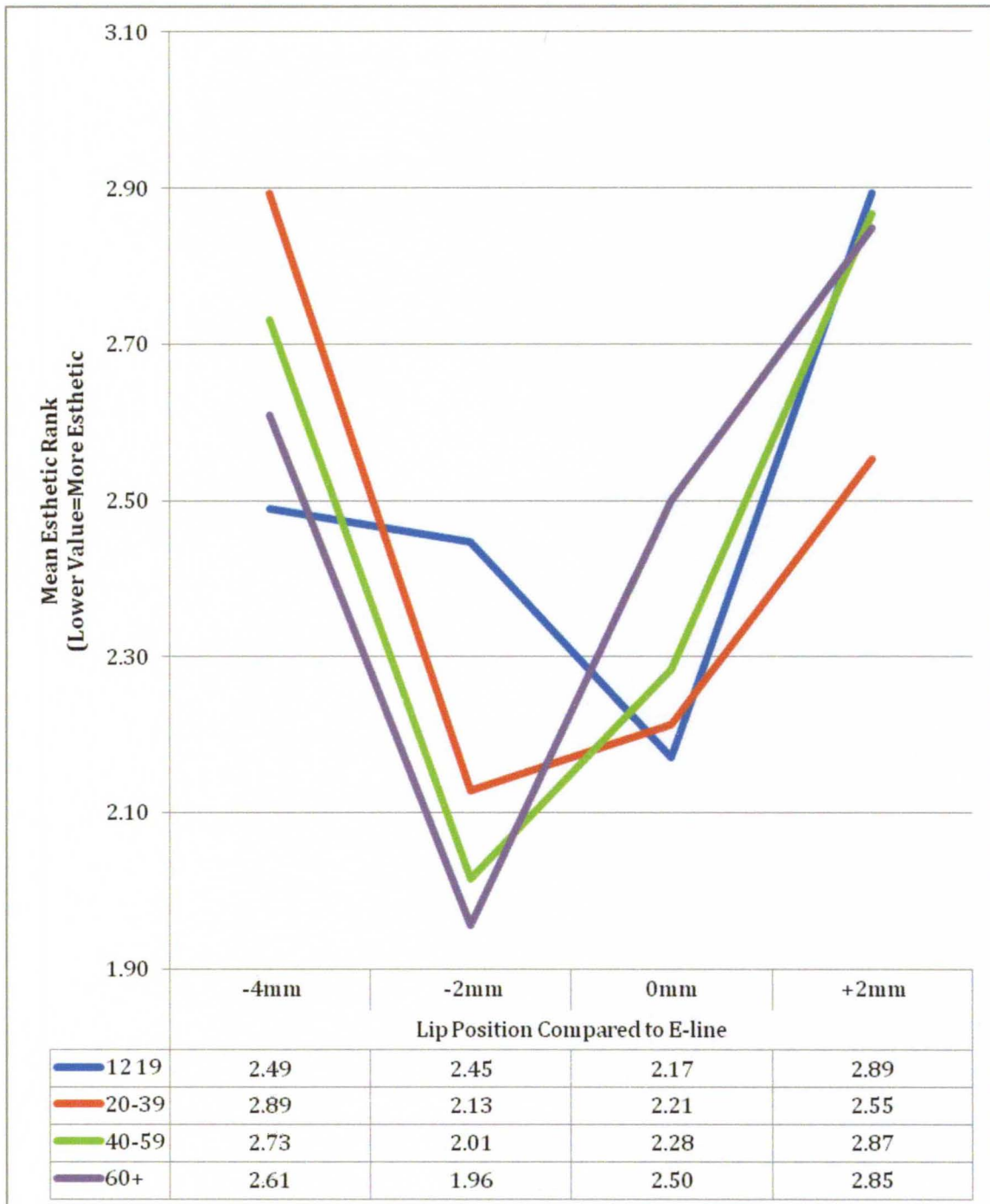
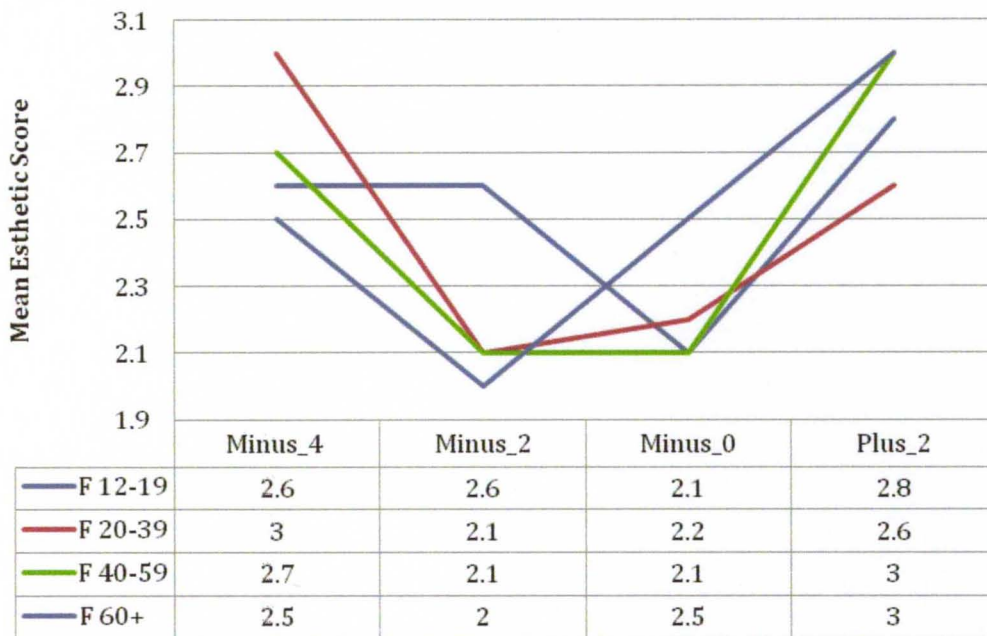


Figure 4. Line Graph of Mean Esthetic Ranks of Each Age Group

Female Age Group Comparison



Male Age Group Comparison

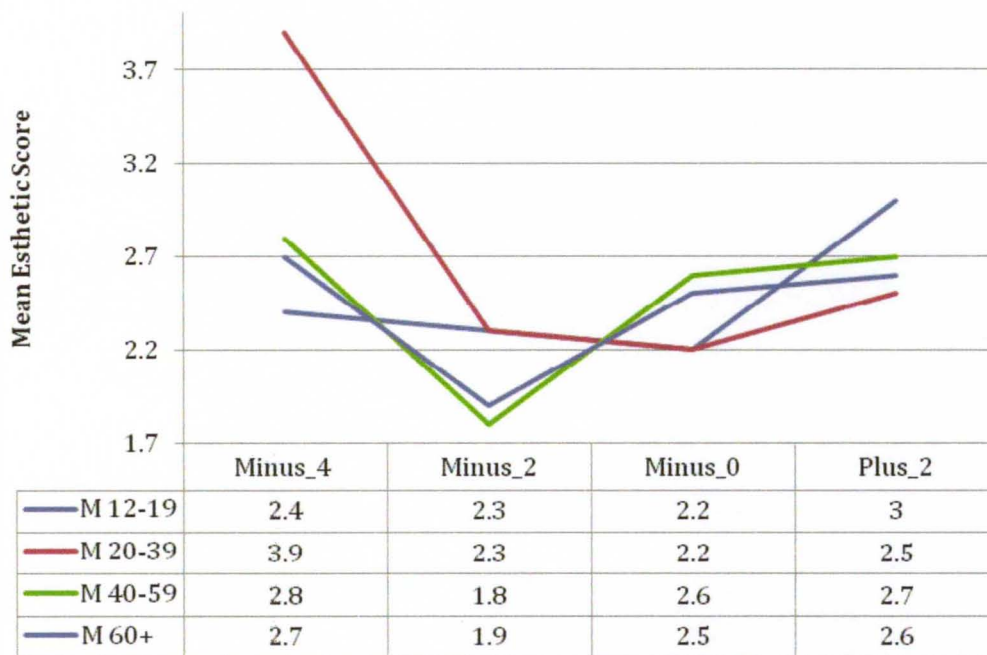


Figure 5: Male and Female Age Group Comparison

CHAPTER IV

DISCUSSION

Orthodontist have many variables and factors to consider when treatment planning a patient. Lip position is an important factor when trying to maintain facial balance and overall esthetics. There are obvious extremes in both crowding and spacing that would almost always necessitate either extraction or non-extraction treatment modalities. However, when faced with a patient with minor to moderate crowding, choosing whether or not to extract can have a dramatic change to the patient's profile. In this study it was shown that, as a general rule, patients in the age range of 12-19 prefer a lip position that is on the e-line, given a normal facial angle. This preference then changed in all older age groups to the profile that has lips 2mm behind e-line. This seems consistent with Ricketts clinical observation that younger children should have a slightly fuller profile than older patients. However, these ideal lip positions chosen by the lay public are all more protrusive than originally described by Ricketts as ideal. Ricketts in his paper stated that adult ideal lip position should be -4mm +/-3mm. That gives an ultimate range of -7mm to -1mm behind e-line. All age groups over 19 years of age chose the -2mm lip position, with lips on the e-line being second favorite. This seems to demonstrate that the ideal profile today may be fuller across all ages than older studies indicated.

One of the questions raised in this paper is why there is a difference in

what is perceived as esthetic between the youngest age group and all other age ranges. Is it due to new social norms, media, and icons who share similar profiles, or is it simply a manifestation of normal facial changes found in the growth and maturation of the face? It is difficult to know if the 60 year old woman who preferred the most retrusive profile felt that same way when she was 16, or if the 16 year old girl who preferred the most protrusive profile will still feel that way when she is 60. Such a study would require many years of prospective observation of a sample population. We can however, try and see if the changes in facial esthetic preferences correlates with changes observed in the growth of the face. In this study we found that there was a change in profile preference between the 12-19 year olds and the 20-39 year olds. Futhermore, each age group found the on e-line profile less and less esthetic as age increased: 2.17, 2.21, 2.28, 2.50 respectively. Bishara[23] found in a study analyzing soft tissue profile changes from 5 to 45 years of age that “the upper and lower lips became significantly more retruded in relation to the esthetic line between 15 and 25 years of age in both males and females; the same trends continued between 25 and 45 years of age.” This seems to follow the esthetic trends found in this study. This may suggest that the esthetic ideal found within a population is simply a manifestation of the current facial growth changes found within the individual.

This study used the e-line to evaluate the lip protrusion. Although there are many other reference lines that could have been used, e-line was used

because of its frequent use in similar research and it being one of the most convenient reference lines for clinicians to use chairside.[24]

This study used only one, ideal profile, with normal sized nose and chin, with the lips position being the only variable. A recent study by Coleman et al[21] in 2007 asked three different evaluators, children 10-18, parents, and orthodontists (ages not specified) to position lips in a position they found to be esthetically ideal given variable chin positions. What is interesting to note is that the profile with the chin position that is similar to that used in this study had all three groups of evaluators place the lips around 4-5mm behind e-line. There are a couple of possible reasons for this difference. One is that Coleman's study had a wider range of possibility, and, when given even more options, observers were less hesitant to choose -4mm, since it was not in the extreme range, but instead more in the middle. In this study, however, -4mm was at the extreme end, along with +2mm, and therefore may make the observer tend to avoid an "extreme" answer as esthetic. Another reason is what is done to the nasolabial angle and mentolabial fold during the more protrusive example. In Coleman's study, only the central parts of the lips were brought out, making any profile beyond -4mm look "poochy". In this study, the mentolabial fold and nasolabial angle were softened as the lips came out (see figure 5). Which is more of a realistic outcome of tooth/lip protrusion depends on a variety of soft tissue, skeletal, and dental factors and debatable from both sides.

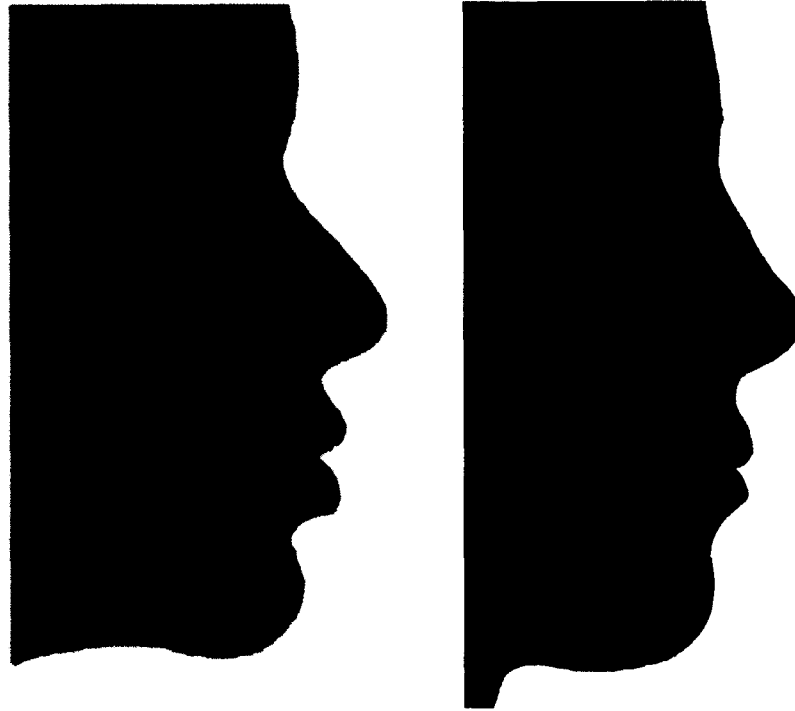


Figure 6: Profile with Lips on E-Line, Coleman Study (on left) vs. Current Study (on right)

Although it makes sense that the middle two positioned lip positions were the 1st or 2nd favorites for all age groups, if only for a tendency to not pick the extremes, it was interesting to note that the youngest group, who's preferred profile was fuller than the older groups, also gave the most retrusive group a better mean esthetic score than any other group (see figure 4). This may be due in part to there being more males in this group than any of the other groups, as males tend to prefer a more concave profile.[18] Given a larger sample size, it would be more effective to randomly select an equal number of males and females in each age group to avoid possible sex bias.

This study also did not exclude any race from participating in the study. The older two groups had a larger percentage (28%, 24%) of African American participants than the younger two groups (19%, 15%). Most research on the

effect of race on facial beauty perception indicates that, on average, African American individuals prefer a lip position equal to, or more protrusive than, what the Caucasian population prefers. Considering this research, the older two age groups would prefer a profile even less protrusive than the numbers currently indicate if those races were excluded from the study.

Many studies have shown that it is difficult to define beauty within any set criteria because of the many variables that have to be considered such as age, gender, culture, and race. Stoner felt that “each man’s concept of beauty is a matter of his own innermost sensibility and understanding.”[25] Although each age group had a profile in which the mean was lower (more esthetic) than all other profiles, it cannot be assumed that every given individual within a certain age group will agree with the finding. In fact, every profile had ranks for most esthetic and least esthetic within each age group. This means that within a given age range there are individuals who find a certain lip position to be most attractive, while others from the same age group will find that same lip position to be the least attractive. This finding stresses the importance of the clinician spending time discussing with the patient what they find attractive, and not relying on their own judgement of facial beauty. Progel suggested that “it is necessary to have an open and uninhibited discussion with the patient to discern if the treatment should be guided by an ethnic or by cultural norms.”

CHAPTER V

CONCLUSIONS

A. Summary:

The aims of this paper were to determine if any age group had a preferential lip position and if so, did it show that younger groups preferred a more protrusive profile than older generations. This study was able to demonstrate that each age group had a statistically significant preferred lip position. This study was also able to demonstrate that the youngest age group, 12-19, preferred a profile that was 2mm fuller than the other age groups. Finally, this study demonstrated that ages 20 years and older preferred a lip position that was 2mm behind e-line.

B. Conclusions:

This study sought to determine if in general there was a certain trend among different age groups towards a certain favorably esthetic lip position. It was able to demonstrate that, on average, certain age groups preferred certain lip positions. It is not this study's purpose to recommend clinicians to use this data as an advocate towards one treatment philosophy versus another. Ultimately, the amount of variation among individual responses clearly indicated that, although a general preference was found within each age group, one cannot assume the individual patient will have similar preferences. It is important to give each patient autonomy, present them with all possible beneficial treatment options, and have an understanding that what the clinician finds to be "beautiful"

might not be what the patient find to be their ideal. As Margaret Hungerford put it, “beauty is in the eye of the beholder”.

Finally, some limitations have been shown in this study, as well as any study that looks to tackle such a subject. One is the unequal balance of males versus females, and races in each age group. Although this was a snapshot of the demographics coming to the dental school, a better study might have a larger population taken from many locations and then randomly selected respondents chosen with equal number of males, females, and races included in each age group. Another issue was that, since there is such variability in how lip protrusion can be shown, with differing nasolabial angles, mentolabial folds, and chin and nose size, is nearly impossible to include that many variables in a survey. Clinician must take all of this into account and add it to their own clinical judgement on how the individual patient will respond when lip positions are changed.

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Appendices

Appendix A: Individual Survey Responses

Age	Sex	Ethnicity	Profile 4 (-4)	Profile 1 (-2)	Profile 3 (0)	Profile 2 (+2)
12	M	Caucasian	2	4	1	3
12	M	Caucasian	4	1	2	3
12	M	Caucasian	1	2	3	4
13	M	African American	4	1	3	2
13	M	Caucasian	4	2	1	3
13	M	Caucasian	1	3	4	2
13	M	Caucasian	2	2	3	4
13	F	African American	4	2	2	3
13	F	Asian	1	3	2	4
13	F	Caucasian	1	3	2	4
14	M	Caucasian	4	3	1	2
14	M	Caucasian	1	2	4	3
14	M	Caucasian	1	2	4	3
14	M	Caucasian	1	3	2	4
14	F	Caucasian	4	2	1	3
14	F	Caucasian	2	1	3	4
14	F	Caucasian	1	3	4	2
14	F	Caucasian	1	3	2	4
14	F	Caucasian	4	3	2	3
14	F	Caucasian	1	2	3	4
15	M	African American	1	2	3	4
15	M	African American	4	1	2	3
15	M	Caucasian	4	3	1	2
15	M	Caucasian	1	3	2	4
15	M	Caucasian	1	3	2	4
15	M	Caucasian	1	4	2	3
15	M	Caucasian	4	3	1	2
15	F	Caucasian	2	1	3	4
16	M	African American	3	1	2	2
16	M	Caucasian	2	3	1	4
16	M	Caucasian	4	3	1	2
16	M	Caucasian	3	1	4	2
16	F	African American	4	3	2	1
16	F	Caucasian	4	3	2	1
16	F	Caucasian	3	2	1	4
16	F	Caucasian	1	3	2	4
16	F	Caucasian	4	2	1	3
16	F	Hispanic	1	3	4	2
17	M	Other	3	2	2	1
17	M	Caucasian	1	3	2	4
17	M	Caucasian	3	1	2	4
17	F	Caucasian	2	1	3	4
17	F	Caucasian	2	4	3	1
17	F	Caucasian	4	3	1	2

17	F	Caucasian	4	3	1	2
18	F	African American	3	4	1	2
18	F	African American	4	3	2	1
20	F	African American	3	4	1	2
20	F	Caucasian	4	2	1	3
20	F	Other	4	1	3	2
21	M	African American	2	1	4	3
22	M	Caucasian	3	3	2	2
22	F	Caucasian	4	3	1	2
22	F	Caucasian	3	1	2	4
23	M	African American	4	3	2	1
23	F	African American	2	1	3	4
24	F	Caucasian	4	3	1	2
24	F	Caucasian	4	3	1	2
24	F	Caucasian	3	4	1	2
25	F	Caucasian	4	3	1	2
26	M	Caucasian	4	2	3	1
26	M	Other	3	2	1	4
26	F	Caucasian	3	1	4	2
28	M	Caucasian	2	4	1	3
28	M	Caucasian	3	3	2	1
28	F	African American	2	1	4	3
29	F	Caucasian	2	1	3	4
31	M	Caucasian	4	1	3	2
31	F	Caucasian	1	2	4	3
32	M	Caucasian	1	3	2	3
32	F	Caucasian	3	1	3	2
32	F	Hispanic	3	1	1	2
33	M	Caucasian	4	1	3	2
33	F	Caucasian	3	1	3	2
33	F	Caucasian	4	2	3	1
33	F	Caucasian	4	2	1	3
33	F	Caucasian	4	3	1	2
33	F	Caucasian	1	3	2	4
34	M	African American	4	2	1	3
34	M	Caucasian	2	2	3	3
34	F	Caucasian	2	1	3	4
35	F	African American	1	2	4	3
36	M	Caucasian	4	1	2	3
36	F	Caucasian	1	2	3	4
36	F	Caucasian	4	3	2	1
37	F	Caucasian	4	2	1	3
37	F	Caucasian	2	3	4	1
38	M	Caucasian	4	3	1	2
38	M	Other	1	4	2	3
38	F	Caucasian	4	2	1	3
38	F	Caucasian	4	2	1	3
38	F	Caucasian	1	2	3	4
38	F	Caucasian	4	2	3	1
39	M	Caucasian	2	1	3	4
40	M	Caucasian	1	3	4	2

40	F	Caucasian	2	3	1	4
40	F	Caucasian	1	3	2	4
41	F	African American	2	1	3	4
42	F	Caucasian	2	3	2	2
42	F	Caucasian	2	2	3	3
43	M	Caucasian	4	3	1	2
44	M	African American	3	1	4	2
44	M	Caucasian	2	1	3	4
44	F	Caucasian	2	1	3	4
45	M	Caucasian	2	1	3	4
45	M	Caucasian	2	1	3	4
45	F	African American	1	2	3	4
45	F	African American	4	3	2	1
45	F	Caucasian	2	1	4	3
45	F	Caucasian	4	3	1	2
46	M	Caucasian	4	3	1	2
46	F	Caucasian	3	1	2	4
46	F	Caucasian	2	1	3	4
47	F	African American	2	1	3	4
47	F	Caucasian	3	1	2	4
47	F	Caucasian	4	1	3	2
47	F	Caucasian	4	3	1	2
48	M	Caucasian	4	1	3	2
48	F	Caucasian	4	2	1	3
48	F	Caucasian	4	1	2	3
48	F	Caucasian	3	4	2	1
49	M	African American	3	3	3	3
49	F	Caucasian	2	1	3	4
50	M	African American	4	1	3	2
50	M	African American	2	4	1	3
50	F	African American	3	2	1	4
50	F	Caucasian	1	3	2	4
50	F	Caucasian	2	1	4	3
51	M	Caucasian	3	2	3	1
51	F	Caucasian	2	1	3	4
51	F	Caucasian	3	2	1	4
51	F	Caucasian	3	2	1	4
51	F	Caucasian	3	4	1	2
52	M	Caucasian	2	1	3	4
52	M	Caucasian	4	2	3	2
52	F	African American	1	4	3	2
52	F	Other	4	2	1	3
53	F	Caucasian	4	3	1	2
53	F	Caucasian	2	1	4	3
53	F	Caucasian	2	3	1	4
54	M	Caucasian	2	1	4	3
54	F	African American	4	2	1	3
54	F	Caucasian	3	1	2	4
55	F	African American	2	1	4	3
55	F	African American	3	3	2	3
55	F	African American	4	1	2	3

55	F	Caucasian	4	3	1	2
55	F	Caucasian	2	4	1	3
55	F	Caucasian	4	1	3	2
56	M	African American	4	2	1	1
56	M	African American	1	2	1	1
56	F	African American	3	4	1	2
56	F	Caucasian	1	2	4	3
57	M	African American	3	1	2	4
57	F	Caucasian	1	4	2	1
57	F	Caucasian	4	2	3	1
58	M	Caucasian	3	1	2	4
58	M	Other	2	1	4	3
58	F	African American	4	3	2	1
59	F	Caucasian	4	2	1	3
59	F	Caucasian	2	1	3	4
60	F	Caucasian	4	3	1	2
60	F	Caucasian	1	2	3	4
60	F	Caucasian	2	3	1	4
60	F	Caucasian	3	1	2	4
62	F	Caucasian	1	2	3	4
62	F	Caucasian	2	1	3	3
63	M	African American	4	3	1	2
63	F	African American	2	4	1	3
64	M	African American	1	3	4	2
64	M	Caucasian	3	1	4	2
64	F	African American	4	2	3	1
64	F	Caucasian	2	1	4	3
65	M	Caucasian	3	2	4	1
65	M	Caucasian	1	3	2	4
65	F	Caucasian	4	1	2	3
66	M	African American	2	1	4	3
66	M	Caucasian	4	3	1	2
68	M	Caucasian	3	4	1	2
68	F	African American	1	2	3	4
68	F	Caucasian	3	2	1	4
68	F	Caucasian	3	4	2	1
68	F	Caucasian	3	4	1	2
68	F	Hispanic	4	1	3	2
69	F	Caucasian	3	1	2	4
69	F	Caucasian	1	2	3	4
69	F	Caucasian	4	3	2	1
69	F	Other	2	1	3	4
70	M	Caucasian	4	1	2	3
70	M	Caucasian	1	1	4	1
70	F	Caucasian	4	1	3	2
71	M	Caucasian	3	2	1	4
71	M	Caucasian	2	1	3	4
72	F	Caucasian	4	1	2	3
72	F	Caucasian	2	1	3	4
72	F	Caucasian	2	1	3	4
73	M	Caucasian	4	1	3	2

73	F	African American	1	4	3	2
73	F	African American	4	2	1	3
74	M	Caucasian	4	2	1	3
74	M	Caucasian	2	1	3	4
74	F	African American	2	1	4	3
75	F	Caucasian	2	1	4	3
78	F	African American	1	4	3	2
80	F	Caucasian	2	1	3	4
81	F	African American	4	3	1	2
83	F	Caucasian	2	1	4	3

Appendix B-1: Subject Informed Consent

IRB assigned number:11.0057

Investigator(s) name & address: Dr. Sunita Chandiramani and Dr. David Butler
501 S. Preston St.
Dept of Orthodontics
Louisville KY, 40202

Site(s) where study is to be conducted: **University of Louisville** School of Dentistry
501 S. Preston St.
Dept of Orthodontics
Louisville KY, 40202

Phone number for subjects to call for questions: David Butler @ 503.753.2387

Introduction and Background Information

You are invited to take part in a research study. The study is being conducted under the direction of Dr. Sunita Chandiramani and Dr. David Butler. Approximately 200 local subjects will be invited to participate. Completion of this survey should take no longer than a couple of minutes.

Purpose

The purpose of this study is to **determine what the general public finds to be the most attractive silhouette when comparing different amounts of lip protrusion**

Procedure

The following is a brief survey where you will compare a set of profile silhouettes and rank them in order of attractiveness. This survey is completely voluntary and you can choose to not answer any questions you do not feel comfortable with.

Potential Risks

There are no known risks linked with study.

Benefit

The information collected may or may not benefit you directly; however, the information learned in this study may be helpful to others.

Alternative

Instead of taking part in this study, you could choose not to participate

Compensation

You will not be compensated for your time, inconvenience, or expenses while you are in this study.

Costs

There will be no costs to you for participating

Confidentiality

Total privacy cannot be guaranteed. We will protect your privacy to the extent permitted by law. If the results from this study are published, your name will not be made public. The following may look at your research and medical records:

- The sponsor and others hired by the sponsor to oversee the research
- The University of Louisville Institutional Review Board, Human Subjects Protection Program Office, Privacy Office and others involved in research administration at the University

- People who are responsible for research and HIPAA oversight at the institutions where the research is conducted
- Government agencies, such as: (List all that apply)
 - Office for Human Research Protections,
 - Office of Civil Rights,

Security

Your data will be kept private by physical surveys being locked in a cabinet and data being stored on a password secured computer.

Voluntary Participation

Taking part in this study is completely voluntary. You may choose not to take part at all. If you decide not to be in this study, you won't be penalized or lose any benefits for which you qualify. If you decide to be in this study, you may change your mind and stop taking part at any time. If you decide to stop taking part, you won't be penalized or lose any benefits for which you qualify.

You will be told about any new information learned during the study that could affect your decision to continue in the study.

Contact Person

If you have any questions, concerns, or complaints about the research study, please contact:
David Butler 503.753.2387

Research Subject's Rights

If you have any questions about your rights as a research subject, you may call the Human Subjects Protection Program Office at (502) 852-5188. You may discuss any questions about your rights as a research subject, in private, with a member of the Institutional Review Board (IRB). You may also call this number if you have other questions about the research, and you cannot reach the study doctor, or want to talk to someone else. The IRB is an independent committee made up of people from the University community, staff of the institutions, as well as people from the community not connected with these institutions. The IRB has reviewed this research study. (Do not state approved. This section is mandatory for all studies.)

Concerns and Complaints

If you have concerns or complaints about the research or research staff and you do not wish to give your name, you may call the toll free number 1-877-852-1167. This is a 24 hour hot line answered by people who do not work at the University of Louisville. (This section is mandatory for all studies.)

Acknowledgment and Signatures

This informed consent document is not a contract. This document tells you what will happen during the study if you choose to take part. Your signature indicates that this study has been explained to you, that your questions have been answered, and that you agree to take part in the study. You are not giving up any legal rights by signing this informed consent document. You will be given a copy of this consent form to keep for your records.

Printed Name of _____ Signature of Subject/Legal Representative Date Signed
Subject/Legal Representative _____

Printed Name of Person _____ Signature of Person Explaining Date Signed
Explaining Consent Form _____ Consent Form (if other than the Investigator)

Explaining Consent Form _____ Consent Form (if other than the Investigator)

Printed Name of Investigator Signature of Investigator _____ Date Signed

<u>LIST OF INVESTIGATORS</u>	<u>PHONE NUMBERS</u>
<u>Dr. Sunita Chandiramani</u>	<u>502.852.5625</u>
<u>Dr. David Butler</u>	<u>503.753.2387</u>

Appendix B-2: Guardian of Minor Subject: Informed Consent

IRB assigned number: 11.0057

Investigator(s) name & address: Dr. Sunita Chandiramani and Dr. David Butler
501 S. Preston St.
Dept of Orthodontics
Louisville KY, 40202

Site(s) where study is to be conducted: **University of Louisville** School of Dentistry
501 S. Preston St.
Dept of Orthodontics
Louisville KY, 40202

Phone number for subjects to call for questions: David Butler @ 503.753.2387

Introduction and Background Information

Your child is invited to take part in a research study. The study is being conducted under the direction of Dr. Sunita Chandiramani and Dr. David Butler. Approximately 200 local subjects will be invited to participate. Completion of this survey should take no longer than a couple of minutes.

Purpose

The purpose of this study is to determine what the general public finds to be the most attractive silhouette when comparing different amounts of lip protrusion.

Procedure

The following is a brief survey where **your child** will compare a set of profile silhouettes and rank them in order of attractiveness. This survey is completely voluntary and **your child** can choose to not answer any questions **they** do not feel comfortable with.

Potential Risks

There are no known risks linked with study.

Benefit

The information collected may or may not benefit **your child** directly; however, the information learned in this study may be helpful to others.

Alternative

Instead of taking part in this study, **your child** could choose not to participate

Compensation

You and your child will not be compensated for your time, inconvenience, or expenses while you are in this study.

Costs

There will be no costs to you or your child for participating

Confidentiality

Total privacy cannot be guaranteed. We will protect your child's privacy to the extent permitted by law. If the results from this study are published, your child's name will not be made public. The following may look at your research:

- The sponsor and others hired by the sponsor to oversee the research
- The University of Louisville Institutional Review Board, Human Subjects Protection Program Office, Privacy Office and others involved in research administration at the University
- People who are responsible for research and HIPAA oversight at the institutions where the research is conducted
- Government agencies, such as:
 - Office for Human Research Protections,
 - Office of Civil Rights

Security

Your data will be kept private by physical surveys being locked in a cabinet and data being stored on a password secured computer.

Voluntary Participation

Taking part in this study is completely voluntary. Your child may choose not to take part at all. If your child decides not to be in this study, they will not be penalized or lose any benefits for which he/she qualify. If your child decides to be in this study, he/she may change his/her mind and stop taking part at any time. If your child decides to stop taking part, he/she won't be penalized or lose any benefits for which they qualify.

You will be told about any new information learned during the study that could affect your **child's** decision to continue in the study.

Contact Person

If you have any questions, concerns, or complaints about the research study, please contact:
David Butler 503.753.2387

Research Subject's Rights

If you have any questions about your rights as a research subject, you may call the Human Subjects Protection Program Office at (502) 852-5188. You may discuss any questions about your rights as a research subject, in private, with a member of the Institutional Review Board (IRB). You may also call this number if you have other questions about the research, and you cannot reach the study doctor, or want to talk to someone else. The IRB is an independent committee made up of people from the University community, staff of the institutions, as well as people from the community not connected with these institutions. The IRB has reviewed this research study.

Concerns and Complaints

If you have concerns or complaints about the research or research staff and you do not wish to give your name, you may call the toll free number 1-877-852-1167. This is a 24 hour hot line answered by people who do not work at the University of Louisville

Acknowledgment and Signatures

This informed consent document is not a contract. This document tells you what will happen during the study if you choose to take part. Your signature indicates that this study has been explained to you, that your questions have been answered, and that you agree your child can take part in the study. You are not giving up any legal rights by signing this informed consent document.

Printed Name of	Signature of Subject/Legal Representative	Date Signed

Legal Representative _____

Printed Name of Person _____ **Signature of Person Explaining** _____ **Date Signed** _____
Explaining Consent Form _____ **Consent Form (if other than the Investigator)** _____

Printed Name of Investigator _____ **Signature of Investigator** _____ **Date** _____
Signed _____

LIST OF INVESTIGATORS	PHONE NUMBERS
Dr. Sunita Chandiramani	502.852.5625
Dr. David Butler	503.753.2387

Appendix B-3: Survey Questionnaire

Please complete the following survey. Completion of this survey is completely voluntary.

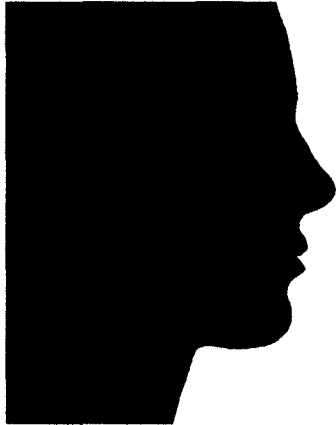
1: Age:

2: Sex: M F

3: Do you have any training in the dental profession? Y N
If yes, please explain:

4: Race/Ethnicity: Caucasian African American Asian Hispanic
Other _____

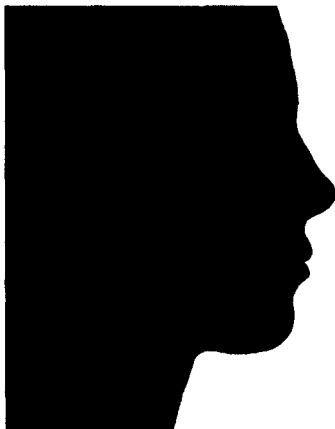
5: Instructions: Please rank the following silhouettes 1-4, in order of most attractive to least attractive (1 being most attractive, 4 being least attractive). Circle the corresponding number.



Rank: 1 2 3 4



Rank 1 2 3 4



Rank: 1 2 3 4



Rank 1 2 3 4

CURRICULUM VITAE

NAME: David Butler

ADDRESS: 8624 Hickory Falls Ln
Pewee Valley KY 40056

DOB: Arlington, Tx USA – December 21, 1979

EDUCATION

MS and Cert University of Louisville Orthodontics Program 2009-Present

DMD Oregon Health Sciences University School of Dentistry 2009

BS Brigham Young University, Exercise Science Major 2004

Graduated Cum Laude GPA: 3.86

HONORS AND AWARDS

Tuition Scholarships for Academic Excellence at OHSU Dental School 2005-2009

Phi Kappa Phi Honor Society Member 2004-2009

1st Place – Sigma Xi Research Fraternity Research Symposium 2008

3rd Place - Oregon Dental Convention Table Clinic Research Competition 2008

4th Place - Oregon Dental Convention Table Clinic Research Competition 2006

RESEARCH

Master's Thesis "Generational Differences in Perceived Esthetics of Soft-Tissue Lip Protrusion"

Principle Investigator, "An In-vitro Study of Fluoride Release and Recharge for Resin-modified Glass Ionomer Treated with Fluoridated Dentifrice"

Research Assistant, Ortho Master's Thesis – "Cephalometric variables as predictors of mandibular growth rotation"

Principle Investigator, "A Product Review of Software-Based Patient Education"

PROFESSIONAL ACTIVITIES

Class President – U of L Orthodontic Class of 2010 2009-Present

President/Founder, OHSU Orthodontic Student Special Interest Group 2006-2009

Philanthropy Chair, Xi Psi Phi Dental Fraternity 2007-2009

Advertising Committee, Student Research Group 2007

Activities Chairman Class of 2009 2006-2007

Historian Class of 2009 2006-2007

Gross Anatomy Teaching Assistant at OHSU School of Dentistry 200