THE RELATIONSHIP BETWEEN FACIAL CONVEXITY IN YOUNG CHILDREN AND PERCEIVED INTELLIGENCE

Dr Sivabalan Vasudavan, BDSc, MDSc, MPH, MOrth, RCS, MRACDS (Ortho), FDSRCS
Andrew L. Sonis, DMD

Dr Sivabalan Vasudavan is a Specialist Orthodontist in Claremont, Western Australia; Senior Research Fellow, Faculty of Science, University of Western Australia; and Visiting Lecturer at Boston Children's Hospital, and the Developmental Biology, Harvard School of Dental Medicine, Boston, Massachusetts, USA

Dr Andrew L. Sonis is a Senior Associate and Specialist in Orthodontics, Paediatric Dentistry, and Oral Medicine, Boston Children's Hospital, and Clinical Professor of Developmental Biology, Harvard School of Dental Medicine, Boston, Massachusetts, USA

ABSTRACT

Objective: The principle objective of this study was to investigate the relationship between a pre-adolescent child's perceived intelligence and their sagittal facial relationship as determined by second and third grade elementary school educators.

Materials and Methods: A digitized lateral cephalogram and photograph of an eight-year old child with Class I occlusion and normal overbite and overjet were entered into the Dolphin software program. The lateral cephalogram and photograph were linked to allow computerized manipulation to generate five profiles with a Steiner ANB value ranging from two to ten degrees by retruding the mandible in four profiles at two degree intervals and one profile by proclining the maxillary incisors to create an overjet relationship of 10 mm. Each profile simulation was then converted to a simple silhouette and printed out to create a series of "flashcards".

Results: Fifty Elementary School teachers force ranked the profile silhouette flashcards for perceived intelligence. Profile images corresponding to Steiner ANB angles of two and four degrees consistently filled the position of highest in intelligence perception. Conversely, the position of lowest intelligence was exclusively filled by profile images with ANB angles of eight and ten degrees. Images with ANB angles equal to two and four degrees had a 48% and 52% chance respectively to be ranked as having the highest intelligence, while figures with ANB angles of eight and ten degrees had 16% and 84% chance respectively to be ranked as having the lowest intelligence.

Conclusion: According to our data, elementary school teachers almost uniformly associate a retrognathic profile of a pre-adolescent child with decreased intelligence. The findings of our study re-affirm the need for considering psychological indications for initiating interceptive orthodontics treatment in class II child patients.

INTRODUCTION

The psychosocial effects of facial appearance are well documented in the literature. The benefit of early interceptive orthodontics for Class II malocclusions is a source of conjecture amongst clinicians. The answer is further complicated by psychosocial considerations and the very multifactorial presentation of molar class II relationship, which has been reported by many investigators.[1-3] While it is understood that class II malocclusion can result from a combination of dental and skeletal components, the study of McNamara (1981) suggests that mandibular skeletal retrusion is the most common characteristic contributing to this diagnosis.[4]

Clinically, these characteristics produce a facial profile view that in social settings is subject to judgment by others. As such, a profile with a five-degree increase in Subspinale-Nasion- Supramentale (SNB) angle is rated significantly as more attractive than a profile with a five-degree decrease in SNB angle.[5] Furthermore, it has been shown that both orthodontist and lay people are relatively sensitive to small horizontal changes, 3 mm or more, in the mandible's position.[6]

Comparison and judgment of peers is common amongst children, and increased overjet is a significant predictor of teasing amongst children and parents seeking treatment.[7] It has also been reported that both parents and children expect improvements in social interaction in addition to improvements in appearance and oral function from orthodontic treatment.[8] Thus, it is critical for a clinician to be informed about psychosocial factors affected by malocclusion in a child's life in order to both educate the child/parent and address the concerns and expectations of a child/parent regarding orthodontic treatment.

Early interceptive orthodontics has been studied in order to determine its true benefits. Early treatment is intended to augment skeletal and dental maturity, prior to the eruption of the permanent dentition. Phase 1 therapy is said to intercept malocclusions in a manner that will produce a superior, more stable result than that would have been achieved if treatment commencement was deferred to the permanent dentition. Proponents of early treatment firmly believe that any subsequent full-fixed orthodontic appliance therapy would be reduced in duration and complexity. In 1992, one-third of children in the USA undergoing orthodontic treatment were treated in two phases.

What are the benefits of treating patients with a two-phase therapy as opposed to a single phase? What are the benefits of early treatment to the orthodontist? Is early treatment more efficient than a later, singular phase of orthodontic treatment? Do the benefits of early treatment justify the added expenditure, timing and effort involved? Is the quality of treatment better, same, or worse in cases treated early?

Joondeph (1993) stated that, "the objective of early orthodontic treatment is to create a more favourable environment for future dentofacial development. Interceptive treatment can reduce the amount of dental compensations to skeletal discrepancy that is often associated with a more severe malocclusion in late adolescence".[9]

Justus (2008) tabled the proceedings of the workshop discussion on early treatment.[10] One hundred and fifty nine Diplomats of the American Board of Orthodontics were surveyed on their perceived benefits of early treatment and these included:

- A better and more stable result.
- A greater ability to modify skeletal growth.
- Improved patient self-esteem and parental satisfaction.
- Less extensive therapy is required later.
- Reduced potential for iatrogenic tooth damage such as trauma, root resorption and decalcification.

Furthermore, King and associates (1999) published their findings from a survey of orthodontists, who believed that their patients who had received phase 1 orthodontic treatment, had seemingly less complex malocclusions as compared to untreated patients requiring full-fixed appliance therapy.[11,12] Other perceived benefits to the orthodontists include a greater ability to modify growth, a subsequent back-up or second attempt that is available to solve the malocclusion, reduction in complexity of mechanics in full fixed appliance therapy and subsequently reduced chair time.

The goals of early treatment may include the following[13]:
1. To prevent progressive, irreversible soft-tissue or bony changes.
2. To improve skeletal discrepancies and provide a more favourable environment for normal growth.
3. To improve occlusal function.
4. To enhance and possibly shorten phase II comprehensive treatment.
5. To provide more pleasing facial aesthetics, thus improving the psychological development of the child.

The indications for the commencement of orthodontic treatment in the mixed dentition include:
- Posterior and anterior crossbites.
- Functional improvement.
- Improved esthetics that occurs with the anterior crossbite correction.
- Ankylosed teeth.
- Excessive protrusions and diastemas.
- Severe anterior and lateral open bites.
- Ectopic molars are best treated when discovered.
- Severe arch length discrepancies are found in the mixed dentition, and it is clear that bicuspid extractions are needed for resolution.
- Patients with cleft palates.
- Pseudo Class III patients.

The above indicators pertain to scenarios of a specific nature, where early or interceptive care is necessitous. However, an assessment of philosophy of early treatment should focus on the routine treatment of malocclusions.

However, results of several prospective randomized clinical trials all demonstrated no statistically significant improvement in treatment outcomes with the initiation of an early phase I treatment.[14-16] More specifically, a completed 2-phase treatment produces comparable skeletal changes to that of a 1-phase treatment by the end of treatment course; thus early phase I interceptive orthodontics only temporarily causes skeletal changes.[17] It has also been shown that by the end of treatment, both 1 and 2-phase orthodontics produce similar arch dimensions[18] and have similar incisor injury incidence.[19] One can also point to the overall longer course of treatment in combined phase I and II treatment relative to phase II only[20] and the need for follow up in permanent dentition after phase I interceptive orthodontics as a disadvantage.[21] However, none of these studies consider any psychosocial variables in their analyses.

It is worth noting that, though it doesn't produce finished quality treatment without the second phase, interceptive orthodontics is effective in reducing malocclusion. As such it has been shown that it improves esthetics, crowding, crossbite and overbite as compared to no intervention.[21] Nevertheless, benefits such as eliminating destructive habits, improving certain growth patterns (though temporarily), and helping with a patient's self-image are thought to motivate orthodontists to initiate interceptive treatment.[22] The rational for such motivations is explained at least by one study which positively correlates physical attractiveness with happiness for both men and women, and self-esteem for women.[23]

Since children with normal dental appearance are judged to be better looking, more desirable as friends and more intelligent,[22] early interceptive orthodontics gains more importance. The importance of attractiveness has been shown in several studies. Human beings judge one another based on physical appearance, despite the old maxims of "beauty is only skin deep" or "never judge a book by its cover". It has been demonstrated that in general, human beings designate positive attributes to more attractive individuals and negative attributes to less attractive individuals.[23] This judgment of character based on appearance has also raised questions regarding social and psychosocial costs of obesity. As such, it has been reported that there exists anti-fat bias amongst the general population and to a lesser degree amongst health care professionals.[24]

In several meta-analyses, researchers have found that, while there is agreement within and across cultures on who is attractive, attribution of positive characteristics to attractive individuals are followed by more positive treatment and behavior towards those individuals relative to less attractive individuals.[25] One can imagine the influence of this discriminatory behavior, which is often unconscious, on development of a child. Indeed it has also been shown that attractive children and adults exhibit more positive characteristics. The mechanism of the phenomenon perhaps can be explained by the "self-fulfilling prophecy", a term coined by sociologist Robert K. Merton. Through the positive feedback that more attractive individuals receive from others, the false premise of more attractive individuals actually having more positive characteristics becomes a true premise. Thus, contrary to beliefs that beauty is not determinant of character and behavior, beauty plays an important role in social interaction and development.

As for a child spending ample time in school, interactions with teachers become subject of scrutiny when evaluating social and academic development. Teacher's perception regarding a child's characteristics has been shown to influence the teacher's expectation of performance in a child. There are several variants that influence a teacher's expectancy; ethnicity, attractiveness or even an older sibling's prior academic performance have been shown to be powerful factors in forming a teacher's perception. Specifically, previous studies seem to predict a positive relationship between a child's attractiveness and the teacher's expectation.[26] Teacher expectancy has been shown to account for year-end ethnicity achievement gap.[27] Furthermore, in a double blind study, it was shown that teachers rated attractive children higher and held lower expectations regarding future social and academic performance for less attractive children.[28] Even an older sibling's academic performance has been shown to influence the teacher's expectancy and child's performance.[29]

The significance of these findings is evident in the link between teachers' expectation and a child's achievement. Hence, teacher's expectation of a child has been shown to influence child's achievements.[30] Thus, factors that influence the perception and judgment of teachers are a matter of concern. As such, ethnicity, race and attractiveness have been studied in relation to teacher bias; yet, no study has explored the teacher's perceived intelligence judgment that may stem from a profile view of a child, mainly a class II appearance.

When deciding whether to start interceptive orthodontics for a child patient, a clinician may consider possible psychosocial benefits in addition to parent and child's expectation of treatment and the stage of growth and development of a child. In this regard,

for a patient with class II malocclusion, it would be beneficial for a clinician to consider the perceived intelligence of the child, specifically by teachers. The purpose of the present study was to investigate the effect of a child's profile on perceived intelligence as judged by second and third grade elementary school educators.

MATERIALS AND METHOD

Hypothesis: The hypothesis of this study is that a child's profile impacts a teacher's perception of intellectual ability. Specifically, the severity of a child's class II malocclusion is inversely related to perceived intelligence by elementary school educators.

Subjects: Following approval by the IRB, letters were sent out to the principles and headmasters of 30 public and private elementary schools to recruit 50 subjects for the study. A convenience sample was obtained by enrolling the first fifty "Second" or "Third" grade teachers to volunteer for the study. The mean age of subjects was 33.8 years with a range of 22-58 years. The gender distribution was 10 males, 40 females with 24 located in private schools and 26 in public schools. All participants were from the greater Boston, Massachusetts area.

Profile Silhouettes: An eight year old Caucasian male with a Class I molar and canine relationship, normal overbite and overjet of 2mm and normal cephalometric values of SNA: 82˚, SNB: 80˚ and ANB: 2˚ was used as the template. A digital lateral cephalogram and profile photograph were obtained with the patient in natural head position. The photograph and cephalogram were linked using Dolphin software version 9 and altered to create 4 additional images. The four digitally altered images were created by moving the mandible posteriorly at 2˚ intervals. Thus, images were created with a SNA of 82˚ and SNB ranging from 78˚ to 72˚, and ANB ranging from 4˚ to 10˚. Silhouetted facial profiles were then created on the original and four altered images by reducing the gamma-scale to produce a two-tone black and white image (Figure 1). The resulting five images, including the original image, were printed on 3" by 5" photographic grade copy papers to produce "profile flash cards". Letters a, b, c, d and e were assigned to each profile flash card randomly and in no particular order.

Intelligence Ranking: The "profile flash cards" were manually shuffled and laid out on a flat surface in front of a seated individual subject in a well-lit isolated room. The subject was then asked to arrange the "profile flash cards" in order of perceived intelligence from low to high. The subjects were given 60 seconds to complete this task. The time constraint placed on the subjects was enforced to invoke their first impression. The order of the profiles was then recorded on a data collection sheet which also included the subject's age, gender, and employment sector (private vs. public).

RESULTS

Fifty teachers ranked five images in order of decreasing intelligence. Profile images corresponding to ANB angles of 2˚ and 4˚ consistently filled the position of first in intelligence perception. Conversely, position of lowest intelligence was exclusively filled by profile images with ANB angles of 8˚ and 10˚ (Table I). Images with ANB angles equal to 2˚ and 4˚ had a 48 and 52 percent chance respectively to be ranked as having the highest intelligence, while figures with ANB angles of 8˚ and 10˚ had 16 and 84 percent chance respectively to be ranked as having the lowest intelligence (Table II). Figures 3 show the distribution of rank orders.

DISCUSSION

Modern dentistry emphasizes evidence based clinical practice. The impact and influence of orthodontic treatment has been studied in various arena so that its' public health and psychosocial benefits are better measured. As such, various studies suggest that orthodontics affects general health or oral health related quality of life minimally in adolescents.[30] Furthermore, lack of orthodontic treatment does now seem to lead to adverse psychological problems.[31] More specifically, one of the topics under study has been early interceptive orthodontics. This study aimed to examine the psychological benefit of early interception in class II malocclusion from the angle of teacher-student relationship.

According to our data, teachers almost uniformly associate a class II profile of a child with less intelligence. In this study, teachers were given one minute to deduce a judgment after looking at all the profile photos. A limited time was allowed for ranking of the profile photos to illicit the first impression that comes to mind. The rational for this technique is that only a fraction of a second of exposure to a facial profile is sufficient for people to make an inference on character or trait. Increased time only allows for more confidence in judgment and a more differentiated character designation.[32]

In this study, the ethnicity of teachers were not recorded, thus ethnicity of teachers as a variable could not be controlled. Another limitation of this study was the sampling method of the study. A convenience sample allows for introducing selection bias. Although more women chose to participate in the study than men, for the purpose of this study, the population of teachers was presumed homogeneous.

When thinking of examples of a severe class II profile, one may recall images of Bart Simpson or Disney's Goofy. Both characters represent a silly or dumb character. In the same manner our modern media sets standard for what is a fit or thin body and what is an attractive face, in more subtle ways it can lead us to form impressions or stereotypes of what intelligent or dumb people look like. Hence, a class II facial appearance in a child may be a tool for teasing by others, a cause for a teacher's bias, and a cause of concern for parents. The findings of our study re-affirm the need for considering psychological indications for initiating interceptive orthodontics treatment in class II child patients. Future studies on impression forming and behaviors towards children with class II malocclusion could shed more light on possible benefits of early interceptive orthodontics.

	Rank 1	Rank 2	Rank 3	Rank 4	Rank 5
ANB=2˚	24	25	1	0	0
ANB=4˚	26	24	0	0	0
ANB=6˚	0	1	39	10	0
ANB=8˚	0	0	10	32	8
ANB=10˚	0	0	0	8	42

Table 1. Distribution of ranks

	Rank 1	Rank 2	Rank 3	Rank 4	Rank 5
ANB=2˚	0.48	0.5	0.02	0	0
ANB=4˚	0.52	0.48	0	0	0
ANB=6˚	0	0.02	0.78	0.2	0
ANB=8˚	0	0	0.2	0.64	0.16
ANB=10˚	0	0	0	0.16	0.84

Table 2. Chance of intelligence rank for each silhouette

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Email address for correspondence:

andrew.sonis@childrens.harvard.edu

Figure 1. From Upper left to lower right: Silhouettes corresponding to ANB of 2˚, 4˚, 6˚, 8˚, 10˚.
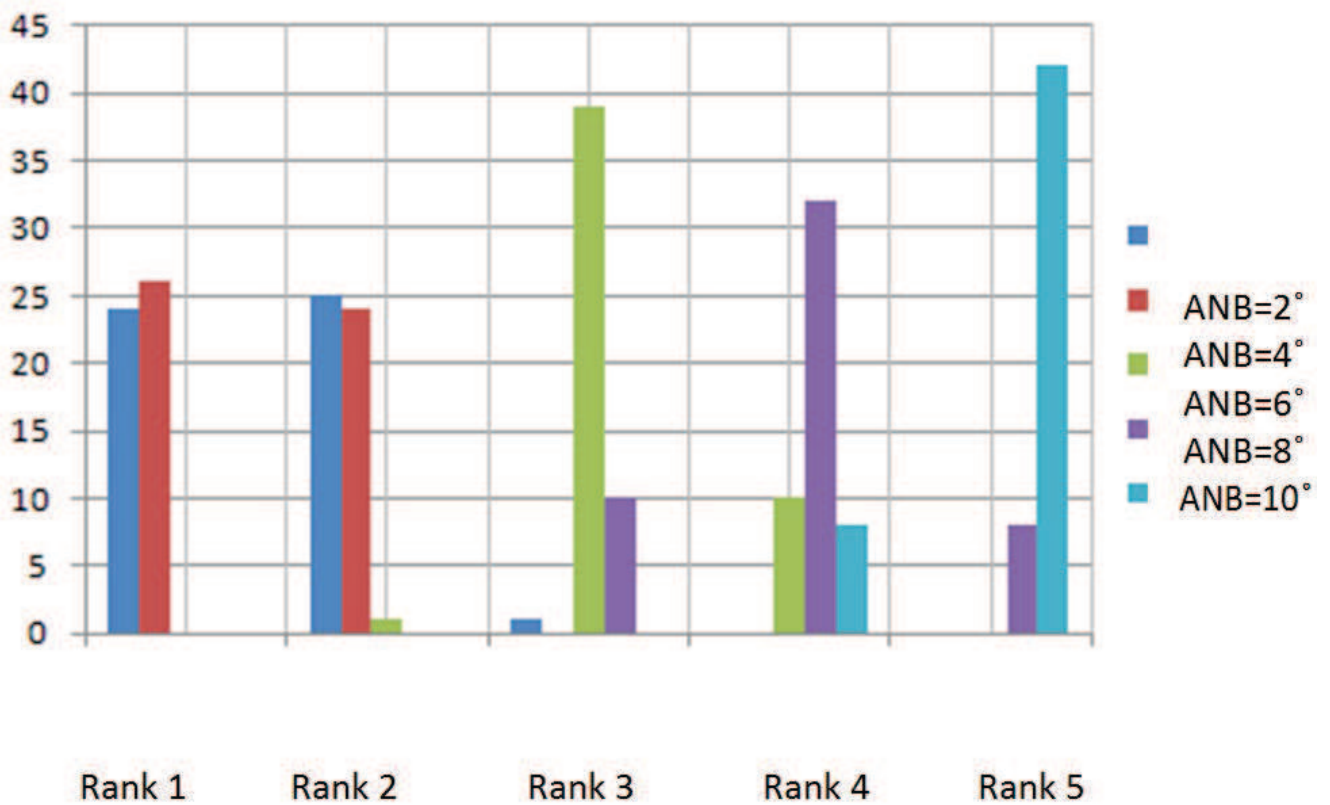

Figure 2. Distribution ranking orders for all five silhouette profiles