

INFLUENCE OF COLOR ON ATTRACTIVENESS OF SKY HOOK TYPE MAXILLARY PROTRACTOR

ABSTRACT

AIM: To evaluate the esthetic attractiveness of the Sky Hook type of maxillary protractor, available in different colors. **MATERIAL AND METHODS:** Eight Sky Hook type of maxillary protractors of different colors were evaluated. Images were obtained of the same patient, and standardized with the aid of an image manipulation program (Adobe Photoshop software from CS) to obtain the colors: white, gray, green, yellow, blue, pink, brown and black. After acquisition the images were printed on photographic paper and incorporated into a specific and personalized questionnaire. The questionnaire was distributed among children of both genders, in the age-ranges from 7 to 8, and 9 to 10 years, at public and private schools (n=200). From the scores attributed to each image, the Mann-Whitney test was used, and among groups, Spearman's Correlation. The level of significance adopted was 5%. **RESULTS:** The scores attributed to the color green presented significant difference between the schoolchildren from public and private schools. In a comparison between genders, the boys awarded better scores to the colors gray and black, whereas the girls awarded better scores to the color pink. When the age groups examined were compared, only the color blue presented statistical differences. **CONCLUSION:** The color of the Sky Hook type of maxillary protractor has an influence on the esthetic attractiveness to children from 7 to 10 years, and preference determined by colors is also influenced by gender and the type of school (public or private) and age group.

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KEYWORDS

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INTRODUCTION

Class II malocclusion is characterized by an anteroposterior discrepancy, which may or may not be accompanied by skeletal alterations. The majority of cases are linked to maxillomandibular bone decompensations, which may be caused by maxillary deficiency, either associated with mandibular protrusion, or not^{1, 2}. In cases of dental malocclusion the case may be resolved with orthodontic treatment alone. Whereas in cases of bone disharmony there are various treatment philosophies that mainly depend on the patient's age³⁻⁶.

Early treatment of this malocclusion should begin on conclusion of primary dentition and beginning of mixed dentition, which comprises the period that precedes the puberal growth spurt. The time when one may obtain the best orthopedic effects and least dentoalveolar effects, preventing tooth extractions or orthognathic surgery in the future.⁷

In the literature, the most accepted treatment in these cases is rapid expansion of the maxilla association with protraction using facial masks⁸⁻¹⁰, because early orthopedic correction of the bony bases enables growth to occur in a more balanced manner, and greater stability of the treatment.

Therapy with a facial mask provides a constant anterior force on the maxilla, which changes the orientation of facial growth and is

indicated particularly for cases of Class III malocclusion, due to the anteroposterior and transverse deficiency of the maxilla^{11, 12}.

Among the various types of facial masks available, there is the Sky Hook type of maxillary protractor mask, which is an appliance that is custom made for the patient, and enables the use of protraction forces of high magnitude. It can be used in dolicofacial patients, as it provides better vertical control and less rotational power of the mandible, by virtue of the mandibular redirection force and restriction of vertical growth of alveolar process of the maxilla^{13, 14}. (não achei nada semelhante nas refs consultadas)

One of the great limitations of this therapy is the lack of commitment and cooperation by the patient and parents with regard to use of the appliance for the determined period. It is worth pointing out that high value is placed on esthetics nowadays, and in many cases the use of the appliance coincides with the pre-puberal period, in which the patient's body is on the point of beginning the process of accelerated growth, changes in body composition and sexual maturation, which may be accompanied by psychological changes. Therefore many patients find it very difficult to accept treatment with external appliances, and this frequently leads to being unfavorable to the effectiveness of treatment. By virtue of the problem stated, a pertinent question arises:

would the color of maxillary protractor appliances be a factor that would lead to greater or less commitment to treatment by these patients? Based on the foregoing discourse, the aim of this study was to evaluate the esthetic attractiveness of the Sky Hook type of maxillary protractor in different colors.

MATERIAL AND METHODS

The study was conducted with digitized images of a maxillary protractor for facial orthopedics of the Sky Hook type, with the aim of evaluating the esthetic preferences of children from public and private schools, of both genders, in the age-range from 7 to 10 years old. A specific personalized questionnaire was produced, which allowed precise and reproducible responses about the esthetic appearance of the orthopedic face masks. The images were captured with a digital camera (Canon Rebel XTI, macro 60mm, Japan) mounted on a tripod with a fixed focus/object distance.

The images were uploaded onto a computer and standardized with the aid of image manipulation software (Adobe Photoshop CS, Adobe Systems Inc, San Francisco, CA). To limit the confounding variables, the same model was used, with the same shirt and image background. The appliances were standardized in the colors White, Gray, Green, Yellow, Blue, Pink, Orange and Black. (Figure 1). After image acquisition,

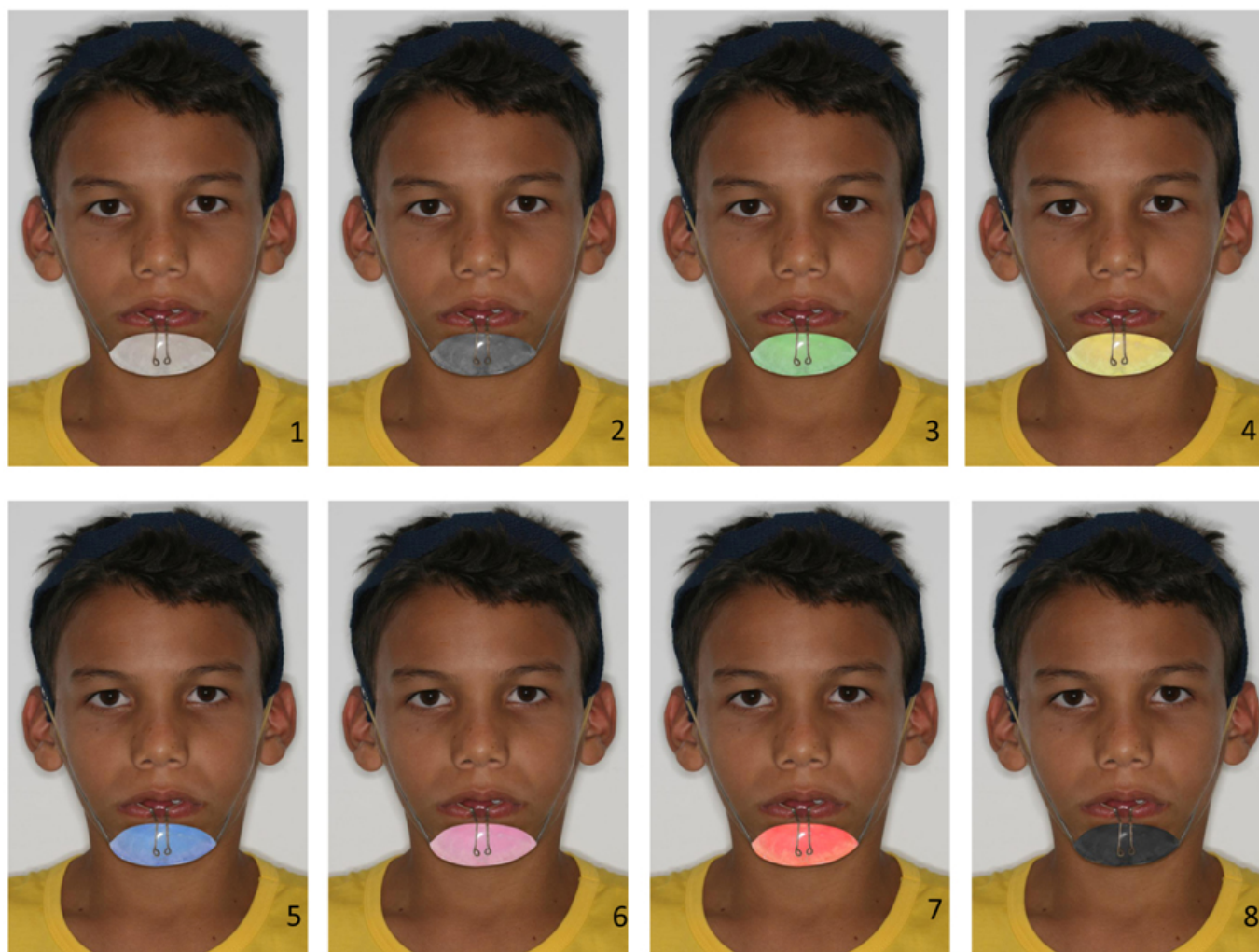
they were printed on photographic paper and incorporated into the questionnaire. For participation in the research, children in the age-range from 7-10 years of age, who had never been submitted to treatment with an orthopedic face mask, were selected. All of the surveys were conducted during consultations held in the pediatric dentistry courses of the School of Dentistry of the State University of Southwestern Bahia. The questionnaires were handed out, and the participants were asked not to proceed with the next question, if they had not answered the previous one. The subjects were informed that these images represented their capacity to select various face masks for orthodontic treatment. They were instructed to take 1 minute to look at all the images before beginning the research. By doing this, the subjects were able to familiarize themselves with all the masks before evaluating the image exhibited for the first time. After this, the images were presented with a printed scale showing values that ranged from 0 to 10, in which they attributed a score to the image, with 10 being the best and 0 the worst image.

To arrive at the number of individuals to be researched, a sample calculation was made, and the number of 200 individuals was found for the target population studied. Each research image was evaluated twice for reliability. All the values used for statistical analysis were means of both evaluations. For

acceptability, recorded as zero or one, this produced a value of 0.5 if the subject evaluated chose the mask as acceptable at one moment and unacceptable at another. These responses

represented an acceptable lie of analysis of the face masks.

Figure 1. Sky Hook type of maxillary protractor inserted in a patient, shown in different colors 1- White, 2- Gray, 3- Green, 4- Yellow, 5- Blue, 6- Pink, 7- Orange and 8- Black.



The procedures followed were in accordance with the ethical standards of the responsible committee on human experimentation and with the Helsinki Declaration of 1975, as revised in 2000.

The scores of the grades attributed to each image were compared using the Mann-

Whitney U-test. The means of scores awarded to each image were calculated in each group in order to determine the Spearman correlation coefficients, to evaluate the similarity between the schoolchildren's perceptions by type of school, gender and age group. The level of significance adopted was 5% ($\alpha = 0.05$). The

data were tabulated and analyzed in the statistical program BioEstat (version 5.0, Belém/PA, Brazil).

RESULTS

Table 1 shows the demographic data of the study participants. The mean \pm Standard Deviation (SD) of participants' age was 8.9 ± 1.1 years.

The mean of scores attributed to each image, per type of school is shown in Table 2. Only the scores attributed to the color green showed significant difference between the groups.

Table 3 shows that significant differences were found between the male and female genders for the colors gray, pink and black. Comparisons between pairs showed that the boys awarded better scores to all of them except for the color pink, to which better scores were attributed by the girls.

Table 4 compares the mean scores attributed by the children, according to age-range. Only the grades awarded to the color blue presented significant difference between the groups. Comparisons between pairs showed that schoolchildren in the age-range from 9 to 10 years awarded better scores to the color blue, compared with those from 7 to 8 years.

DISCUSSION

In the literature, the most accepted early treatment of Class III malocclusion, resulting from maxillary atresia, is the use of palatine separation followed by protraction with a facial mask. This therapy is capable of promoting transverse expansion and anterior protraction of the maxilla. However, it is a treatment that depends on the professional's experience and knowledge and is directly related to the degree of cooperation by the patient and his/her family members. There are various types of maxillary protractors described in the literature, which may be prefabricated or custom made. Basically, they all have the same purpose: To cause maxillary protraction and redirect mandibular growth. Each of these has characteristics and advantages that must be administered by the orthodontist at the time these masks are chosen.^{8, 10, 11, 15}

The Sky Hook type of maxillary protractor basically consists of chin cup with an acrylic base, made by taking an individual impression of the patient's face; lateral anchorage loops that serve as support for the elastics of the occipital shell ; vertical loops that accompany the contour of the chin and rise parallel to the bottom lip, ending with the fabrication of hooks used for placement of the maxillary traction elastics. This appliance provides greater orthopedic effect due to the possibility of using protraction forces of a high

magnitude, generating good results in a shorter time¹⁶. It can be used in Dolicocephalic patients, since it provides better vertical control and lower power of mandibular rotation^{13,14}.

Table 1. Demographic data of study participants per groups.

Characteristics	Public School (n = 100)	Private School (n = 100)
Age (years)		
Mean ± SD	9.2 ± 0.9	8.5 ± 1.1
Median	10.0	8.0
Max - mín	7.0-10.0	7.0-10.0
Gender		
Male	50 (50.0%)	50 (50.0%)
Female	50 (50.0%)	50 (50.0%)
Age-range		
7 to 8 years	24 (24.0%)	52 (52.0%)
9 to 10 years	76 (76.0%)	48 (48.0%)

Table 2. Mean Scores (standard deviation) attributed to the masks, according to type of school.

Image	Type of School		p-Value
	Public School	Private School	
White	5.83 (3.65)	5.54 (3.39)	0.547
Gray	5.51 (3.28)	4.81 (2.86)	0.120
Green	6.59 (2.63)	5.78 (2.72)	0.036
Yellow	6.47 (2.51)	5.91 (2.80)	0.157
Blue	6.91 (2.68)	6.41 (2.80)	0.147
Pink	7.10 (2.77)	6.84 (2.71)	0.417
Orange	6.85 (2.88)	6.90 (2.60)	0.816
Black	6.94 (3.39)	7.08 (3.35)	0.602

Table 3. Mean Scores (standard deviation) attributed to the masks, according to gender.

Image	Gender		p-Value
	Male	Female	
White	6.07 (3.40)	5.30 (3.61)	0.117
Gray	5.64 (3.03)	4.68 (3.09)	0.018*
Green	6.46 (2.77)	5.91 (2.62)	0.137
Yellow	6.45 (2.65)	5.93 (2.67)	0.187
Blue	6.77 (2.75)	5.55 (2.75)	0.529
Pink	6.45 (2.77)	7.49 (2.62)	0.006*
Orange	6.81 (2.59)	6.93 (2.90)	0.376
Black	7.71 (2.97)	6.31 (3.59)	0.003*

Table 4. Mean Scores (standard deviation) attributed to the masks, according to age-range.

	Age-range		
	7 to 8 years	9 to 10 years	
White	5.72 (3.56)	5.66 (3.51)	0.741
Gray	5.02 (3.09)	5.24 (3.10)	0.682
Green	6.10 (2.90)	6.24 (2.58)	0.855
Yellow	5.98 (2.69)	6.32 (2.66)	0.375
Blue	6.14 (2.92)	6.98 (2.60)	0.050*
Pink	6.43 (2.91)	7.30 (2.59)	0.051
Orange	6.67 (2.81)	7.00 (2.70)	0.408
Black	7.33 (3.27)	6.81 (3.41)	0.337

In this context Class III malocclusion not only affects occlusion and masticatory function.. Dentofacial appearance and harmony generally lead to psychological problems in children, such as negative and self-deprecating attitudes and low self-esteem. It is precisely at this stage - the prepuberal period - that the professional should intervene, seeking to control the psychological problems and correct the malocclusion^{17, 18}. The use of facial masks, in this case, is inevitable and they frequently need to be used for 12 to 16 hours per day and for periods of various lengths. Therefore, analyzing the acceptance and esthetic attractiveness of the Sky Hook type of maxillary protractors in different colors offers support to professionals to know how children see them, and whether colors contribute to making them more attractive. Thus, in the present article, the authors was to evaluate the attractiveness of the Sky Hook type of maxillary protractors in 8 different colors.

The opinion of children from 7 to 10 years was used, as they are in the age-range in which orthopedic treatment with these types

of protractor appliances should be started^{8-10, 19}. The groups examined were divided according to age-range from 7 to 8 years and 9 to 10 years; gender and types of school - public and private. An endeavor was made to analyze whether the socio-economic characteristics of the participants had any influence on the attractiveness of these devices.

For this purpose the children were asked to attribute a score (0 to 10) to the colors of the protractors. When the children from public and private schools were compared, it was observed that only the color green presented statistical differences between them. This showed that socio-economic characteristics influenced the attractiveness of the Sky Hook type of appliance.

In a comparison between the genders there were statistical differences for the colors gray, pink and black. The boys attributed better scores to the colors gray and black, whereas the girls showed preference for pink, which was to be expected, considering that society has conventionally attributed the

quality of being feminine to the color pink. Especially because this was a study that was conducted in an age-range in which discernment of differences between the genders is being constructed by social and family conviviality. A study comparing the preference of adolescents and adults of both genders for colored ligation elastics showed the same result as found here for the genders. Patients of the female gender preferred suave red-purple tones, while male patients preferred suave blue-black tones. They also observed that adolescents preferred colored ligation elastics, while older patients preferred less perceptible colors²⁰.

Studies with orthodontic appliances reported an increase in attractiveness of appliances when the patient has the possibility of choosing the color. Children and adolescents preferred appliances that use colored ligation elastics in comparison with self-ligating appliances, which did not offer the possibility of changing the color²¹. As regards the scores attributed by the children according to age-range, only the scores attributed to the color blue showed significant difference between the groups. Comparisons between pairs showed that schoolchildren in the age-range from 9 to 10 years awarded better scores to the color blue, compared with those from 7 to 8 years.

In this study, the use of the computer to alter the colors of the protractors is not one found in clinical practice, because the colors

here obtained are not faithfully the colors of acrylic resins found on the market. Nevertheless, as the same image was used, and only the variable (color) was changed, it cannot be considered a methodological problem.. Moreover, the major purpose of this study was not to set up a database to inform the most attractive colors, but to demonstrate that colors have an influence on the choice and acceptance of the mask, therefore a discussion between the patient and professional about the subject will be necessary, before the appliance is put into place.

The use of means to represent the groups examined is difficult to apply to a patient in the dental chair. Thus, the information should be interpreted carefully, and apply it with caution, in order to personalize this method of evaluation, and allowing each patient to choose, as far as possible, the masked color of appliances to be used.

CONCLUSION

This investigation demonstrated that the color of the Sky Hook type of maxillary protractor has an influence on the esthetic attractiveness to children from 7 to 10 years, and preference determined by colors is also influenced by gender and the type of school (public or private) and age group.

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